SOIL SURVEY OF

Santa Barbara County, California

South Coastal Part

United States Department of Agriculture
Soil Conservation Service and Forest Service
In cooperation with
University of California Agricultural Experiment Station

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all who need the information, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1973. Soil names and descriptions were approved in 1974. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1973. This survey was made cooperatively by the Soil Conservation Service, the Forest Service, and the University of California Agricultural Experiment Station. It is part of the technical assistance furnished to the Santa Barbara and Lompoc Resource Conservation Districts.

Soil maps in this survey may be copied without permission, but any enlargement of these maps could cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and ranches; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Santa Barbara County, South Coastal Part, are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the survey area in alphabetic order by map symbol and shows the page where each soil is described. It also lists the capability unit, vegetative group, and range site in which the soil has been placed, and a rating of each soil for avocado root rot hazard is listed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be placed over the soil map and colored to show soils that have the same limitation or suitability. For example, soils with a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the sections "Capability Grouping" and "Estimated Yields."

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Wildlife Habitat."

Ranchers and others can find, under "Range," groupings of the soils according to their suitability for range and also the names of the plants that grow on each range site.

Community planners and others can read about soil properties that affect the choice of sites for dwellings, industrial buildings, and recreation areas in the sections "Engineering" and "Recreation."

Engineers and builders can find, under "Engineering," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in the South Coastal Part of Santa Barbara County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the survey area given at the beginning of the publication and in the sections "General Nature of the Survey Area" at the end of the publication.

Cover: The city of Santa Barbara lies between the Santa Ynez Mountains and the Pacific Ocean. Camarillo and Goleta soils are near the ocean; Milpitas and Positas soils are on the terraces at the left.

Contents

Issued February 1981

Index to Soil Mapping Units

Summary of Tables

Location of Santa Barbara County, South Coastal Part, in California.

SOIL SURVEY OF SANTA BARBARA COUNTY, CALIFORNIA, SOUTH COASTAL PART

By Gordon E. Shipman

Survey by Gordon E. Shipman, Daniel F. Rabey, and Larry D. Mann, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service and Forest Service, in cooperation with the University of California Agricultural Experiment Station

SANTA BARBARA COUNTY, CALIFORNIA, SOUTH COASTAL PART, is a narrow strip along the Pacific Ocean about 85 miles northwest of Los Angeles (see facing page). The area covers about 218,536 acres, or 341 square miles. It extends from the Ventura County line on the east to Vandenberg Air Force Base on the west and from the approximate crest of the Santa Ynez Mountains on the north to the Pacific Ocean on the south. The central and western parts of the survey area extend into the Santa Ynez drainage area, but most of the survey area is on the southern slopes of the Santa Ynez Mountains.

Elevation range is from sea level to 4,700 feet. Upper slopes of the Santa Ynez Mountains are rough, stony, and precipitous, and foothills are gently sloping to steep. A narrow coastal plain of old terraces, low hills, and small valleys lies between the foothills and the ocean.

Irrigated cropland and extensively urbanized areas are limited to the eastern part of the area where imported water is available. Avocados, lemons, and cut flowers are the most important agricultural products. The western part of the area is used for raising cattle. A few small areas are used for dryfarmed hay or pasture, and the rest is used for range or mining activity.

Santa Barbara is the largest city in the area. It is the county seat and the center of the south coast population cluster that includes Carpinteria, Summerland, Montecito, and Goleta. Population is sparse in the rest of the survey area except for small communities at Gaviota and in the vicinity of San Marcos Pass.

Mild winters, warm dry summers, and scenic mountains and beaches have long attracted people to the Santa Barbara area.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in the South Coastal Part of Santa Barbara County, where they are, and how they are used. The soil scientists went into the survey area knowing that they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes; the kinds of plants or crops; the kind of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Milpitas and Goleta, for example, are the names of two series. All soils in the United States having the same series name have essentially the same characteristics affecting their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or other characteristics that affect man's use of the soil. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Milpitas stony fine sandy loam, 2 to 9 percent slopes, is a stony phase of the Milpitas series.

After a guide for classifying and naming the soils had been worked out, the soil scientist drew the boundaries of the individual soils on aerial photographs. These photographs show buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map in the back of the publication was prepared from aerial photographs.

A mapping unit consists of all areas identified on the soil map by a common symbol. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent because it is not practical to show on such maps all the small,

scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series or of different phases within one series. One such kind of mapping unit, the soil complex, is shown on the soil map of Santa Barbara County, South Coastal Part.

A soil complex consists of areas of two or more soils, so intermingled or so small that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally the name of a soil complex consists of the names of the dominant soils joined by a hyphen. An example is Lopez-Santa Lucia complex, 30 to 50 percent slopes, eroded.

In most areas surveyed, there are places where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called miscellaneous land types and are given descriptive names. Gullied land is a land type in Santa Barbara County, South Coastal Part.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils.

Only part of a soil survey is done when the soils have been named, described, and delineated on the maps and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of woodland and range, and engineers.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others; then they adjust the groups according to results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map shows, in color, the soil associations in Santa Barbara County, South Coastal Part. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in an area, who want to compare different parts of an area, or who want to know the location of large tracts that are suitable for certain kinds of farming or other land uses. Such a map is a useful general guide in managing a watershed or a wildlife area or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure because the soils in any one association ordinarily differ in slope, depth, stoniness, or drainage, and other characteristics that affect their management.

The 13 soil associations in Santa Barbara County, South Coastal Part, are described in the following paragraphs. Two associations are on alluvial fans, in valleys, and on nearly level tidal flats; two are on terraces, on low hills and in small valleys; and nine are on the adjacent foothills and mountains.

Well Drained to Very Poorly Drained, Nearly Level to Moderately Sloping Soils of the Alluvial Fans, Flood Plains, Valleys, and Tidal Flats

The two associations in this group make up about 7 percent of this survey area. They are in broad valleys along the coast that are large enough to be shown on the General Soil Map. The soils are well drained to very poorly drained loamy sands to silty clay loams that formed in alluvium derived from sedimentary rock.

Elevation ranges from near sea level to 500 feet. The average annual rainfall is 15 to 20 inches and the average annual air temperature is about 60° to 62°F. The frost free season is 310 to 330 days.

These associations are used extensively for growing orchards and specialty crops and for urban development. The low, poorly drained areas are not used.

1. *Goleta-Elder-Agueda association*

Nearly level to moderately sloping, well drained sandy loams, fine sandy loams, loams, and silty clay loams on flood plains and alluvial fans and in valleys

This association is in the Carpinteria Valley, on the lower portion of Montecito, in parts of the city of Santa Barbara, and in Goleta Valley. The soils formed in deep alluvium derived from sedimentary rock. Slope ranges from 0 to 9 percent. The native plant cover is annual grasses, forbs, and scattered oaks. Elevation ranges from 25 to 500 feet. The average annual rainfall is 15 to 20 inches and the average annual temperature is 60 to 62° F. The frost free season is 310 to 330 days.

This association makes up 5 percent of the survey area. It is about 40 percent Goleta soils, 20 percent Elder soils, and 15 percent Agueda soils. The rest is Botella variant, Metz, Cortina, and Ballard soils and Riverwash.

Goleta soils have a surface layer of dark grayish brown fine sandy loam or loam. It is underlain by brown and pale brown stratified loamy sand to loam.

Elder soils have a surface layer of dark grayish brown sandy loam. It is underlain by stratified yellowish brown, reddish brown, and brown loamy sand to silty clay loam.

Agueda soils have a surface layer of dark gray silty clay loam. It is underlain by grayish brown silty clay loam and clay loam.

These are the most productive soils in the area.

They are used for all crops grown in the area. Some areas adjacent to stream channels are subject to occasional flooding and streambank erosion.

2. *Camarillo-Aquepts, flooded association*

Nearly level, poorly drained and very poorly drained fine sandy loams on low flood plains and tidal flats

This association is in the low portions of Carpinteria Valley, adjacent to the beaches in the city of Santa Barbara and in the low portion of Goleta Valley. The soils formed in deep alluvium derived from sedimentary rock. Slopes are less than 1 percent. The native cover of the Camarillo soils is annual grasses, tules, willows, and sedges. The native cover of Aquepts, flooded, is tidal marsh vegetation of pickleweed, saltgrass and other water-loving salt-tolerant plants. Elevation ranges from sea level to 50 feet. The average annual rainfall is 15 to 20 inches and the average annual air temperature is about 60° to 62°F. The frost free season is 310 to 330 days.

This association makes up 2 percent of the survey area. It is about 70 percent Camarillo soils and 20 percent Aquepts, flooded. The rest is poorly drained soils that are sandy throughout and small dunes.

Camarillo soils are poorly drained. The surface layer is brown fine sandy loam. It is underlain by stratified pale brown and brown, mottled loamy sand to clay loam. Depth to the water table ranges from about 8 to 6 feet. Most areas have slight or moderate salinity in the subsoil.

Aquepts, flooded, are tidal marshes that are highly stratified with thin layers of coarse textured to fine textured mineral soil and occasional thin peat layers. These very poorly drained soils are almost continually waterlogged and are strongly saline.

Parts of the Camarillo soils are artificially drained and are used for truck or orchard crops, but growth is spotty and erratic. Some areas are urban and others are idle. Aquepts, flooded, have no agricultural value and are idle or used for wildlife.

Moderately Well Drained and Well Drained, Nearly Level to Steep Soils of the Terraces and Coastal Valleys

The two soil associations of this group are within 4 miles of the Pacific Ocean along the coastline in scattered areas from Rincon Creek to Jalama Beach. The soils are moderately well drained or well drained loamy sands to silty clay loams that formed on terraces, old marine sand deposits, or in small coastal valleys. They make up about 13 percent of the survey area.

Elevation ranges from 20 to 800 feet. The average annual rainfall is 14 to 20 inches and the average annual air temperature is 59° to 61° F. The frost free season is 290 to 330 days.

The small valleys and more gently sloping terraces within these associations are used for orchards or truck crops where irrigation water is available, or for dryland hay or pasture where water is not available. Most areas in the vicinity of Santa Barbara, Goleta, and Montecito are used for urban development.

3. *Milpitas-Positas-Concepcion association*

Nearly level to steep, moderately well drained fine sandy loams on terraces

This association is within 4 miles of the Pacific Ocean in scattered areas between Rincon Creek and Gaviota Pass. The soils formed in alluvium derived from sedimentary rock. They are fine sandy loams or loams that are shallow to moderately deep over a dense, very slowly permeable clay subsoil. Slope ranges from 0 to 50 percent. Plant cover is annual grasses, forbs, scattered sagebrush, and small oak trees. Elevation ranges from 30 to 800 feet. The average annual rainfall is 14 to 20 inches and the average annual air temperature is 59° to 61°F. The frost free season is 300 to 330 days.

This association makes up about 11 percent of the survey area. It is about 60 percent Milpitas soils, 20 percent Positas soils, and 10 percent Concepcion soils. The rest is mainly Goleta, Agueda, Elder, Todos, Ballard, and Baywood soils.

Milpitas soils have a surface layer of brown fine sandy loam. The subsoil is very compact and dense yellowish brown clay. Depth to the subsoil is 4 to 30 inches, depending on the amount of erosion. Stones are on the surface and in the soil in some areas.

Positas soils have a surface layer of brown fine sandy loam. The subsoil is very compact and dense reddish brown clay. Depth to the subsoil is about 14 to 28 inches, depending on the amount of erosion. Positas soils occur in intricate patterns on the landscape with Milpitas soils.

Concepcion soils have a surface layer of grayish brown fine sandy loam. The subsoil is compact and dense dark yellowish brown clay. Depth to the subsoil is 6 to 26 inches, depending on the amount of erosion and the slope. In some areas the surface layer is a thick loamy sand.

This association has numerous small valleys dissected by drainageways. Some of these valleys are used for orchards or truck crops. The more nearly level terraces are used for orchards, range, or urban development.

4. *Concepcion-Botella association*

Nearly level to steep, moderately well drained and well drained loamy sands, fine sandy loams, and silty clay loams on terraces and in small valleys

This association is in the vicinity of Point Conception. The soils formed on terraces and in small valleys adjacent to the Pacific Coast. Slope ranges from 0 to about 40 percent. Plant cover is annual grasses and forbs and scattered sagebrush. Elevation ranges from about 20 to 800 feet. The average annual rainfall is 16 to 20 inches and the average annual temperature is 59° to 61° F. The frost free season is 290 to 330 days.

The association makes up about 2 percent of the survey area. It is about 70 percent Concepcion soils and 10 percent Botella soils. The rest is mainly Santa Lucia, Lopez, Baywood soils and Dune land.

Concepcion soils are moderately well drained. They have a surface layer of grayish brown fine sandy loam. The subsoil is dark yellowish brown dense clay which is underlain by brownish yellow heavy clay loam. Depth to clay is about 6 to 26 inches depending upon

the amount of erosion. In some areas these soils have a thick loamy sand surface layer.

Botella soils are well drained. The surface layer is very dark gray silty clay loam. The subsoil is very dark gray and dark grayish brown silty clay loam, and the substratum is brown and grayish brown silty clay loam.

This association is used for range, dryland hay, and pasture. Irrigation water is not available for this association.

Moderately Well Drained to Excessively Drained, Gently Sloping to Extremely Steep Soils of the Foothills and Mountains

The nine soil associations of this group are on foothills and mountains throughout the survey area. These soils are loamy sands to clays that formed in material weathered mainly from shale and sandstone sedimentary rock, but partly from igneous rock. They make up about 80 percent of the survey area.

Elevation ranges from 50 to 4,700 feet. The average rainfall is 16 to 30 inches and the average frost free season is 250 to 330 days. These associations are used mainly for range, wildlife habitat, and watershed. Small areas are used for avocados, lemons, dryland hay, and pasture and for urban development.

5. *Ayar-Diablo-Zaca association*

Gently sloping to very steep, well drained clays on uplands

This association is in the foothills of the Santa Ynez Mountains in narrow bands from Summerland to Gaviota Pass. The soils formed in material weathered from soft marly shale and mudstone. Slope ranges from 2 to 75 percent. Plant cover is annual grasses, forbs, and scattered oaks. Sagebrush grows in some steeper areas. Elevation ranges from 50 to 1,000 feet. The average annual rainfall is 16 to 22 inches and the average annual temperature is 60° to 62° F. The frost free season is 300 to 330 days.

This association makes up 7 percent of the survey area. It is about 40 percent Ayar soils, 15 percent Diablo soils, and 10 percent Zaca soils. The rest is Sespe, Todos, Lodo, Capitan, Milpitas, Gaviota and Nacimiento soils.

Ayar soils have a surface layer of very dark grayish brown clay. The next layer is mixed very dark gray brown and light yellowish brown clay. Soft marly mudstone is at a depth of 30 to 60 inches.

Diablo soils have a surface layer of very dark gray clay. The next layer is very dark gray and light yellowish brown clay. Soft marly mudstone is a depth of 40 to 60 inches.

Zaca soils have a dark gray and very dark gray clay surface layer. The next layer is gray clay. Soft marly mudstone is at a depth of 40 to 55 inches.

This association is used for range. A few areas are used for avocados and lemons, and small areas are used for urban development.

6. *Arnold-Ayar-San Andreas association*

Strongly sloping to very steep, well drained and somewhat excessively drained loamy sands, fine sandy loams, and clays on low uplands

This association is in the southwestern part of the city of Santa Barbara and includes the community of Hope Ranch. The soils formed in material weathered from soft sandstone and mudstone. Slope ranges from 9 to 75 percent. Plant cover is annual grasses, forbs, and scattered oaks. Brush grows on steeper slopes. Elevation ranges from 100 to 800 feet. The average annual rainfall is 16 to 20 inches and the average annual air temperature is 59° to 61° F. The frost free season is 300 to 330 days.

This association makes up 1 percent of the survey area. It is about 40 percent Arnold soils, 20 percent Ayar soils, and 20 percent San Andreas soils. The rest is mainly Tierra, Milpitas, Santa Lucia, Concepcion, and Zaca soils.

Arnold soils are somewhat excessively drained. The surface layer is brown loamy sand. The next layer is [illegible] very pale brown very soft sandstone is at a depth of 50 to 60 inches or more inches.

Ayar soils are well drained. The surface layer is very dark grayish brown clay. The next layer is mixed very dark grayish brown and light yellowish brown clay. Soft shale is at a depth of 40 to 60 inches.

San Andreas soils are well drained. The surface layer is dark grayish brown fine sandy loam. The subsoil is dark grayish brown loam. Soft sandstone is at a depth of 24 to 40 inches.

This association is used for urban development or is idle. Small areas are used for avocados, lemons, or range.

7. *Lodo-Sespe-Todos association*

Steep to very steep, somewhat excessively drained and well drained gravelly clay loams and clay loams on uplands

This association is in a narrow band that parallels the Pacific Ocean in the foothills of the Santa Ynez Mountains. It lies between Rincon Creek and Gaviota Pass. The soils formed in material weathered from fractured shale and sandstone of the Sespe Formation. Slope ranges from 9 to 75 percent. Plant cover is annual grasses, forbs, and oak trees on lesser slopes and chaparral brush on steep slopes. Elevation ranges from 200 to 2,600 feet. The average annual rainfall is 17 to 22 inches and the average annual air temperature is 59° to 61° F. The frost free season is 280 to 330 days.

This association makes up 14 percent of the survey area. It is about 50 percent Lodo soils, 20 percent Sespe soils, and 10 percent Todos soils. The rest is Gaviota, Maymen, Arnold, Milpitas soils and Rock land.

Lodo soils are somewhat excessively drained. The surface layer is dark brown and brown gravelly clay loam. Sandstone or shale bedrock is at a depth of 6 to 20 inches.

Sespe soils are well drained. The surface layer is dark brown clay loam. The subsoil is reddish brown clay and reddish gray clay loam. Reddish-colored fractured soft shale or sandstone is at a depth of 24 to 40 inches.

Todos soils are well drained. The surface layer is dark reddish brown clay loam. The subsoil is dusky red

and dark reddish brown clay. Fractured soft shale or sandstone is at a depth of 40 to 60 inches.

This association is used for range, avocados, and lemons. Steeper areas are covered by chaparral brush and are used for watershed.

8. Los Osos-Gaviota-Maymen association

Strongly sloping to very steep, somewhat excessively drained and well drained sandy loams, clay loams, and stony fine sandy loams on uplands

This association is west of Gaviota Pass in the northern part of the survey area. The soils formed in material weathered from sandstone and shale bedrock. Slope ranges from 9 to 75 percent. Plant cover is annual grasses, forbs, and scattered oak trees. Some slopes are covered by sagebrush or chaparral. Elevation ranges from 150 to 1,900 feet. The average annual rainfall is 16 to 24 inches. The average annual temperature is 59° to 62° F. The frost free season is 290 to 330 days.

This association makes up 9 percent of the survey area. It is about 40 percent Los Osos soils, 30 percent Gaviota soils, and 20 percent Maymen soils. The rest is mainly Santa Lucia and Crow Hill soils and Rock outcrop.

Los Osos soils are well drained. The surface layer is brown clay loam. The subsoil is brown clay. The substratum is dark gray clay loam. Soft shale is at a depth of 20 to 40 inches.

Gaviota soils are somewhat excessively drained. The surface layer is brown sandy loam that overlies shattered but firm sandstone at a depth of 10 to 20 inches.

Maymen soils are well drained. The surface layer is brown stony fine sandy loam. The subsoil is light brown loam that rests on hard fractured sandstone at a depth of 10 to 20 inches.

This association is used for range.

9. Nacimiento-Linne-Capitan association

Moderately steep to very steep, well drained, calcareous silty clay loams, clay loams, and cobbly clay loams on uplands

This association is in a narrow band paralleling the Pacific Ocean from Gaviota Pass to the vicinity of Point Conception. The soils formed in material weathered from calcareous mudstone and shale. Slope ranges from 15 to 75 percent. Plant cover is annual grasses and forbs. Sagebrush grows in some areas. Elevation ranges from 100 to 1,000 feet. The average annual rainfall is 16 to 20 inches. The average annual temperature is 60° to 62° F. The frost free season is 300 to 330 days.

This association makes up 2 percent of the survey area. It is about 30 percent Nacimiento soils, 20 percent Linne soils, and 20 percent Capitan soils. The rest is mainly Gaviota, Lopez, Agueda, and Santa Lucia soils and landslides and Rock outcrop.

Nacimiento soils have a surface layer of grayish brown silty clay loam. The underlying material is grayish brown silty clay loam. Olive brown mudstones and soft shales are at a depth of 40 to 50 inches.

Linne soils have a surface layer of very dark gray clay loam. The underlying material is dark grayish brown clay loam. Soft marly mudstone is at a depth of 26 to 50 inches.

Capitan soils have a surface layer of gray cobbly clay loam that rests on white calcareous conglomerate at a depth of 4 to 18 inches.

This association is used for range.

10. Santa Lucia-Lopez-Crow Hill association

Strongly sloping to extremely steep, somewhat excessively drained and well drained shaly clay loams and silty clay loams on uplands

This association is in the western part of the survey area in the vicinity of Miguelito Creek and Jalama Creek. The soils formed in material weathered from shale of the Monterey Formation and from diatomaceous shale. Slope ranges from 9 to 100 percent. Plant cover is annual grasses, forbs, and oak trees. Brush grows on most steeper and eroded areas. Elevation ranges from 100 to 1,600 feet. The average annual rainfall is 16 to 20 inches and the average annual air temperature is 58° to 62° F. The frost free season is 290 to 330 days.

This association makes up 11 percent of the survey area. It is about 30 percent Santa Lucia soils, 30 percent Lopez soils, and 5 percent Crow Hill soils. The rest is mainly Diablo, Los Osos, Gaviota, Nacimiento, Zaca, and Capitan soils and Pits and dumps.

Santa Lucia soils are well drained. The surface layer is dark gray shaly and very shaly clay loam. Fractured Monterey shale is at a depth of 20 to 40 inches.

Lopez soils are somewhat excessively drained. The surface layer is dark gray shaly and very shaly clay loam. Fractured Monterey Shale is at a depth of 4 to 20 inches.

Crow Hill soils are well drained. The surface layer is gray silty clay loam. The subsoil is grayish brown silty clay loam. Soft fractured diatomaceous shale is at a depth of 20 to 40 inches.

This association is used for range and diatomaceous earth mines.

11. Los Osos-San Andreas-Tierra association

Strongly sloping to very steep, well drained and moderately well drained fine sandy loams, sandy loams, and clay loams on uplands

This association is in a small section in the northwestern part of the survey area. The soils formed in material weathered from soft shale and in old, water deposited sediment. Slope ranges from 9 to 75 percent. Plant cover is annual grasses, forbs, a few oak trees, and brush on the steeper slopes. Elevation ranges from 100 to 1,900 feet. The average annual rainfall is 16 to 24 inches and the average temperature is 60° to 63° F. The frost free season is 300 to 330 days.

This association makes up 1 percent of the survey area. It is about 30 percent Los Osos soils, 20 percent San Andreas soils, and 20 percent Tierra soils.

Los Osos soils are well drained. The surface layer is brown clay loam. The subsoil is brown clay and the substratum is olive gray clay loam. Light olive gray soft shale is at a depth of 20 to 40 inches.

San Andreas soils are well drained. The surface layer is dark grayish brown fine sandy loam. The subsoil is dark grayish brown loam. The substratum

is strong brown soft sandstone at a depth of 24 to 40 inches.

Tierra soils are moderately well drained. The surface layer is grayish brown sandy loam. The subsoil is brownish yellow and yellowish brown very dense compact clay and sandy clay. Depth to clay is 4 to 20 inches depending on the amount of erosion. The substratum is soft sandstone or old water deposited sediment.

This association is used for range. About 30 percent of the area is [illegible] moderately to severely eroded.

12. *Capitan-Linne association*

Moderately steep to very steep, well drained, calcareous [illegible]

This association is in a narrow belt adjacent and parallel to the Santa Ynez River, between Refugio Creek and Gaviota Creek. The soils formed in material weathered from [illegible]. Slope ranges from 15 to 75 percent. Plant cover is annual grasses and forbs. Sagebrush grows on steeper and very shallow areas. Elevation ranges from 100 to 1,000 feet. The average annual rainfall is 16 to 20 inches and the average annual temperature is 60° to 62° F. The frost free season is 310 to 330 days.

This association makes up [illegible] percent of the survey area. It is about 50 percent Capitan soils, and 20 percent Linne soils. The rest is mainly Ayar, Santa Lucia, Diablo, Agueda, and Concepcion soils.

Capitan soils have a surface layer of gray cobbly clay loam that is underlain by white calcareous conglomerate and shale at a depth of 4 to 18 inches.

Linne soils have a surface layer of very dark gray clay loam. The substratum is dark grayish brown clay loam. Soft marly mudstone is at a depth of 26 to 50 inches.

This association is used for range.

13. *Maymen-Rock outcrop association*

Moderately steep to extremely steep, well drained stony [illegible] on mountains

This association is in the Santa Ynez Mountains from Rincon Creek to Gaviota Pass. The soils formed in material weathered from hard sandstone, shale, and conglomerate. Slope ranges from 15 to more than 100 percent. Plant cover is chaparral brush. The least steep areas have a cover of annual grasses, forbs, oak trees, and scattered sagebrush. Elevation ranges from 200 to 4,700 feet. The average annual rainfall is 20 to 30 inches and the average annual air temperature is 57° to 62° F. The frost free season is 250 to 310 days.

This association makes up 33 percent of the survey area. It is about 40 percent Maymen soils and 45 percent Rock outcrop. The rest is mainly Gaviota, Lodo, and Sespe soils.

Maymen soils are well drained. The surface layer is brown stony fine sandy loam. The subsoil is light brown loam. Fractured hard sandstone is at a depth of 6 to 20 inches.

Rock outcrop is excessively drained. The surface is 70 to 95 percent sandstone, conglomerate, and shale. A thin mantle of soil, similar to Maymen soils, is between outcrops of rock.

This association is used for watershed. A few small, smoother areas are used for grazing or building sites.

Description of the Soils

In this section the soil series and mapping units in Santa Barbara County, South Coastal Part, are described. Each soil series is described in considerable detail, and then, briefly, each mapping unit in that series is described. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about [illegible] for the mapping units in that series. Thus, to get the full information about any one [illegible] necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, the sequence of the layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the laymen. The second, detailed and in technical terms, is for scientists, engineers, and others who need to make thorough and precise studies of soils. Color terms are for dry soil unless otherwise stated.

As mentioned in the section "How This Survey was Made," not all mapping units are members of a soil series. Argixerolls and Xererts, landslide areas, for [illegible] they are described in alphabetical order along with the soil series.

Preceding the name of each mapping unit is the [illegible] soil map. Listed at the end of the description of each mapping unit are the capability unit and range site in [illegible]. For the description of each capability unit and range site can be found by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary at the end of this survey, and more detailed information about the terminology and methods of soil mapping [illegible].

Agueda Series

The Agueda series consists of well drained soils in valleys. The soils formed in alluvium derived from calcareous, sedimentary formations. Slope ranges from 0 to 15 percent. Elevation is 50 to 500 feet. Vegetation is annual grasses and forbs, mustard, and scattered oak trees. Average annual precipitation is 16 to 20 inches, mean annual air temperature is 60° to 62° F., and the frost free season is 310 to 330 days.

In a representative profile the surface layer is dark gray silty clay loam about 25 inches thick. The next layer is mixed grayish brown and dark gray silty clay

[1] Italic numbers in parentheses refer to Literature Cited, page 141.

TABLE 1.—*Acreage and proportionate extent of the soils*

Map symbol	Soil name	Acres	Percent
AgA	Agueda silty clay loam, 0 to 2 percent slopes	116	0
AgC	Agueda silty clay loam, 2 to 9 percent slopes	594	0
AgD	Agueda silty clay loam, 9 to 15 percent slopes	156	0.1
AnC	Arnold-Botella complex, 2 to 9 percent slopes	592	0.3
AC	Aquents, fill areas	1,169	0.5
AD	Aquents, flooded	480	0.2
AE	Argixerolls and Xererts, [illegible]	761	0.3
AgL	Arnold loamy sand, 9 to 15 percent slopes	260	0.1
AgE2	Arnold loamy sand, 15 to 30 percent slopes, eroded	298	0.2
AgF2	Arnold loamy sand, 30 to 50 percent slopes, eroded	400	0.2
AgG	Arnold loamy sand, 50 to 75 percent slopes	146	0.1
AhE	Ayar clay, 15 to 30 percent slopes, eroded	1,008	0.4
AhF2	Ayar clay, 30 to 50 percent slopes, eroded	5,446	2.3
AhG	Ayar clay, 50 to 75 percent slopes	1,357	0.6
BaA	Ballard fine sandy loam, 0 to 2 percent slopes	232	0.1
BaC	Ballard fine sandy loam, 2 to 9 percent slopes	1,180	0.5
BbC	Ballard Variant, stony fine sandy [illegible]	1,954	0.8
BcC	Baywood loamy sand, 2 to 9 percent slopes	1,007	0.5
BE	Botella [illegible]	2	0
BgA	Botella clay loam, 0 to 2 percent slopes	172	0
BgC	Botella silty clay loam, 2 to 9 percent slopes	1,068	0.5
BhC	Botella shaly clay loam, 2 to 9 percent slopes	344	0.2
BhC2	Botella Variant shaly clay loam, 2 to 9 percent slopes, eroded	552	0.3
BhD2	Botella Variant silty clay loam, 9 to 15 percent slopes, eroded	256	0.1
Ca	Camarillo fine sandy loam	1,178	0.5
Cb	Camarillo Variant fine sandy loam	903	0.4
CcF	Cieneguitas-Arnold complex, 15 to 30 percent slopes	1,901	0.9
CcG	Cieneguitas-Arnold complex, 30 to 75 percent slopes	3,005	1.4
CeB	Concepcion fine sandy loam, 2 to 5 percent slopes	848	0.4
CgA	Concepcion fine sandy loam, 0 to 2 percent slopes	621	0.3
CgC	Concepcion fine sandy loam, 2 to 9 percent slopes	1,032	0.5
CgC2	Concepcion fine sandy loam, 2 to 9 percent slopes, eroded	1,687	0.8
CgD2	Concepcion fine sandy loam, 9 to 15 percent slopes, eroded	878	0.4
CgF2	Concepcion fine sandy loam, 15 to 30 percent slopes, eroded	726	0.3
CgF2	Concepcion fine sandy loam, 30 to 50 percent slopes, eroded	161	0.1
ChC	Cortina stony loamy sand, 2 to 9 percent slopes	687	0.3
CkE2	Crow Hill silty clay loam, 9 to 15 percent slopes, eroded	157	0.1
CkF2	Crow Hill silty clay loam, 15 to 30 percent slopes, eroded	338	0.2
CkF	Crow Hill silty clay loam, 30 to 60 percent slopes	120	(*)
CkG	Crow Hill silty clay loam, 50 to 75 percent slopes	106	(*)
DaC	Diablo clay, 2 to 9 percent slopes	1,207	0.6
DaE	Diablo clay, 9 to 15 percent slopes	1,077	0.5
DaE2	Diablo clay, 15 to 30 percent slopes, eroded	990	0.5
DaF2	Diablo clay, 30 to 50 percent slopes, eroded	588	0.3
[illegible]	[illegible]	184	0.1
EaA	Elder sandy loam, 0 to 2 [illegible]	1,693	0.8
EaC	Elder sandy loam, 2 to 9 percent slopes	589	0.3
[illegible]	[illegible] complex, 2 to 9 percent slopes	882	0.4
[illegible]	[illegible]	620	0.3
GaE	Gaviota sandy loam, 9 to 30 [illegible]	1,079	0.5
GaF	Gaviota sandy loam, 30 to 75 percent slopes	7,147	3.3
GbG	Gaviota [illegible] complex, 30 to 75 percent slopes	3,259	1.5
GcA	Goleta [illegible], 0 to 2 percent slopes	2,067	0.9
GE	Gullied clay loam, 2 to 9 [illegible]	1 64	0.8
GeA	Gullied loam, 0 to 2 percent slopes	1,831	0.8
[illegible]	[illegible]	69	4
LaE	Lake [illegible] loam, 9 to 30 percent slopes	747	0.3
LaF	Lake [illegible] loam, 30 to 50 percent slopes, eroded	1,360	0.6
LeG	Linne clay loam, 50 to 75 percent slopes	336	0.2
LbG	Los Osos-Diablo complex, [illegible] percent slopes	5,553	2.5
LcF	Los Osos-Diablo complex, 30 to 75 percent slopes	13,470	6.2
LdG	Los Osos-Diablo complex, 50 to 75 percent slope	3,661	1.6
LdH	Los Robles gravelly loam, [illegible] percent slopes	1 188	0.5
Le2	Lopez-Santa Lucia complex, [illegible] percent slopes, eroded	1 474	0.7
LeF2	Lopez-Santa Lucia complex, 9 to 30 percent slopes, eroded	3,592	1.6
LgE2	Los Osos clay loam, 15 to 30 percent slopes, eroded	1 831	0.8
LgF2	Los Osos clay loam, 30 to 50 percent slopes eroded	7 152	3.3
[illegible]	Los Osos-Maymen stony complex, 50 to 75 percent slopes	3 922	1.8
MaE	Maymen stony fine sandy loam, 15 to 30 percent slopes	844	0.4
MaG	Maymen stony fine sandy loam, 30 to 75 percent slopes	6,407	2.9

TABLE 1.—*Acreage and proportionate extent of the soils*—Continued

Map symbol	Soil name	Acres	Percent	Map symbol	Soil name	Acres	Percent
MbH	Mayman-Rock outcrop complex, [illegible] percent slopes	39,209	18.0	SeF2	San Andreas-Tierra complex, 15 to [illegible] percent slopes, eroded	744	0.3
Mc	Metz [illegible] sand	184	1	[illegible]	San Andreas-Tierra complex, 30 to 50 percent slopes, eroded	532	0.2
MdC	Milpitas stony fine sandy loam, [illegible] percent slopes	137	(1)	[illegible]	San [illegible]	198	0.1
MdD	Milpitas stony fine sandy loam, 9 to [illegible] percent slopes	2,047	0.9	SeD2	San [illegible] 9 to 15 percent slopes, eroded	291	0.1
MdE	Milpitas stony fine sandy loam, 15 to 30 percent slopes	1,247	0.6	ScE2	Santa Lucia shaly clay [illegible] 15 to 30 percent slopes, eroded	2,467	1.1
MdF	Milpitas stony fine sandy loam, 30 to 50 percent slopes	687	0.3	ScF2	Santa Lucia shaly clay loam, [illegible] percent slopes, eroded	2,974	1.4
MeC	Milpitas-Positas fine sandy loams, [illegible] percent slopes	5,513	2.5	ScG	Santa Lucia shaly loam, [illegible]	1,507	0.7
MeD2	Milpitas-Positas fine sandy loams, 9 to [illegible] percent slopes, eroded	4,850	2.2	TaE2	Tierra-San Andreas complex, 15 to 30 percent slopes, eroded	303	0.1
MeE	Milpitas-Positas fine sandy loams, 15 to [illegible] percent slopes	1,692	0.8	TaD2	Tierra-San Andreas complex, 9 to 15 [illegible]	143	0.1
MeE2	Milpitas-Positas fine sandy loams, 15 to [illegible] percent slopes, eroded	816	0.3	TbE2	Todos clay loam, 15 to 30 percent slopes, eroded	1,469	0.7
MgF2	Montara stony clay, 15 to 50 percent slopes, eroded	420	0.2	[illegible]	[illegible] complex, 30 to 50 percent slopes, eroded	5,058	2.3
NaF2	Nacimiento silty clay loam, 30 to 50 percent slopes, eroded	670	0.3	XA	Xerorthents, cut and fill areas	811	0.4
NbG	Nacimiento complex, landslide, [illegible]	2,286	1.0	ZaD2	Zaca clay, 9 to 15 percent slopes, [illegible]	32	(1)
OAG	Orthents, 50 to 75 percent [illegible]	1,130	0.5	[illegible]	Zaca [illegible] 15 to 30 percent slopes, eroded	970	0.4
PA	[illegible] loams	1,971	0.9	[illegible]	Zaca [illegible] 30 to 50 percent slopes, eroded	664	0.3
RA	[illegible]	713	(1)		Water	322	0.1
Rb	Rock outcrop-Maymen complex, 75 to 100 percent slopes	26,148	12.0				
SeD2	San Andreas-Tierra complex, 9 to 15 percent slopes, eroded	201	0.1		Total	218,636	100.0

[1] Less than 0.1 percent.

loam about 8 inches thick. The substratum is grayish brown clay loam that is stratified in places.

Reaction is moderately alkaline and calcareous throughout. Permeability is moderate. Effective rooting depth is over 60 inches. Available water capacity is 9 to 11 inches.

These soils are used for growing all climatically suited crops, including walnuts, avocados, and lemons. [illegible] grass and weeds are available.

Representative profile of Agueda silty clay loam, 2 to 9 percent slopes, on a site in dense annual grasses and weeds in Refugio Canyon, 0.5 miles north of U.S. Highway 101 on east bank of creek behind corral:

A11—0 to 11 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; strong fine granular structure; slightly hard, very friable, sticky and plastic; many very fine and fine roots, many very fine and fine interstitial pores; violently effervescent with disseminated lime; moderately alkaline; clear smooth boundary.

A12—11 to 25 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to moderate fine and medium granular; hard, friable, sticky and plastic; many very fine and fine roots, many very fine and fine interstitial and common very fine tubular pores, violently effervescent with disseminated and filaments of lime; moderately alkaline; clear wavy boundary.

AC—25 to 33 inches, grayish brown (10YR 5/2) silty clay loam mixed with dark gray (10YR 4/1) very dark gray (10YR 3/1) and dark brown (10YR 3/3) moist; weak medium subangular blocky structure parting to moderate medium and fine granular; hard, friable, sticky and plastic; common very fine and fine roots; many very fine and fine interstitial and common very fine tubular pores; violently effervescent with disseminated and filaments of lime; moderately alkaline; clear wavy boundary.

C—33 to 66 inches; grayish brown (10YR 5/2) clay loam, dark brown (10YR 3/3) moist; massive, hard, friable, sticky and plastic; few very fine and fine roots; common very fine interstitial and many very fine and fine tubular pores; violently effervescent with disseminated and filaments of lime; moderately alkaline.

Reaction is moderately alkaline throughout the profile and free lime is present throughout the profile. The

A horizon is typically dark gray but may be gray or very dark gray. It is clay loam or silty clay loam. It has moderate or strong granular structure. In some cultivated areas, the A horizon lacks structure if the soil was tilled when too wet. The A horizon is 20 to 36 inches thick.

The C horizon in some areas to a depth of more than 60 inches is stratified clay loam and silty clay loam and is gray, dark gray, grayish brown, or dark grayish brown. It has weak or moderate subangular blocky structure, weak or moderate granular structure, or the horizon is massive.

AnA—Agueda silty clay loam, 0 to 2 percent slopes. This [illegible] soil is in small, irregularly shaped valleys. It has a profile similar to the one described as representative of the series, but this soil is subject to occasional overflow during storms and in some places the top few inches are noncalcareous overwash.

Included with this soil in mapping are small areas of Goleta soils. Also included are a few small areas of soils that have more than 15 percent shale fragments in the profile and others that are silty clay throughout.

Runoff is slow, and the hazard of erosion is slight.

This unit is used for walnuts, lemons, avocados, and urban development. Capability class I(19).

AnC—Agueda silty clay loam, 2 to 9 percent slopes. This gently sloping to moderately sloping soil is in small, irregularly shaped valleys. It has the profile described as representative of the series. This soil is subject to occasional overflow and in places has deposits of noncalcareous overwash on the surface.

Included with this soil in mapping are small areas of [illegible] that are silty clay throughout. In the western part of the survey area are a few small areas of soils that have 15 to 20 percent shale fragments in the profile.

Runoff is medium, and the hazard of erosion is moderate.

This soil is used for walnuts, lemons, avocados, and urban development. Areas that do not have water available are used for dryland grain or range. Capability unit IIe–1 (19, 15), Clayey range site.

AnD—Agueda silty clay loam, 9 to 15 percent slopes. This strongly sloping soil is on small, irregularly shaped [illegible] and in small valleys. It has a profile similar to the profile described as representative of the series, but the surface layer is 5 to 10 inches thinner.

Included with this soil in mapping are small areas of Ayar and Nacimiento soils. Also included are small shaly areas in the western part of the survey.

Runoff is medium, and the hazard of erosion is moderate.

This unit is used for walnuts, lemons, avocados where water is available and dryland grain and range where water is not available. Capability unit IIIe–1 (19, 15), Clayey range site.

AbC—Agueda-Goleta complex, 2 to 9 percent slopes. This complex consists of gently sloping to moderately sloping soils in narrow valleys with slopes of 2 to 9 percent in complex patterns. It is about 40 percent Agueda silty clay loam and 30 percent Goleta fine sandy loam.

Included in mapping are areas of Elder soils, stream channels, Riverwash, and small areas of deeply stratified loamy sands. Deep creek channels that meander through the valleys are subject to bank cutting and sloughing.

The Agueda and Goleta soils have profiles similar to the ones described as representative of their series.

Runoff is medium, and hazard of erosion is moderate.

This complex is used for lemons, avocados, and urban development. Capability unit IIe–1(19).

Aquents, Fill Areas

AC—Aquents, fill areas are reclaimed areas of soils resulting from filling low, poorly drained areas near the ocean. The soil material used for fill as well as the depth of the fill is variable. The water table ranges in depth from about 2 to 6 feet. Permeability is variable, but typically is rapid. Runoff is slow, and the hazard of erosion is slight. Effective rooting depth is variable, and water capacity is variable. Onsite investigation is needed for specific interpretations.

These soils are used mainly for urban development.

Aquepts, Flooded

AD—Aquepts, flooded are nearly level soils along the coast and are periodically covered by tidal water. Most areas are covered with water during unusually high tides, while some of the lower-lying areas are covered daily (fig. 1). Typically they are highly stratified thin layers of coarse to fine textured soil material and occasional layers of peat. They are mottled to the surface, and almost continually waterlogged. They are very saline and support salt-tolerant, water-loving vegetation.

Included within this unit are small areas of Camarillo fine sandy loam, Camarillo variant, fine sandy loam, and Aquents, fill areas.

These soils are very poorly drained and have a high water table and variable permeability. Surface runoff is very slow to ponded, and the hazard of erosion is

Figure 1.—Aquepts, flooded (tidal marsh), in Goleta Slough.

slight. Effective rooting depth is 0 to 10 inches, and available water capacity is variable.

These soils are used by wildlife.

Capability unit VIIIw–1(19)

Argixerolls and Xererts, Landslides Areas

AE—Argixerolls and Xererts, landslides areas are masses of soil material and rock fragments that have slid downslope in recent time, together with the scarred surfaces resulting from such movement. They are commonly associated with moderately fine textured, and fine textured soils that formed in soft, weakly consolidated sedimentary material. Fragments of recognizable layers from the principal associated series are commonly discernible. Areas are shown by a special symbol on the soil map. Argixerolls and Xererts landslide areas, most commonly are on hillsides with slopes of 30 to 50 percent, but may be on somewhat gentler or steeper slopes.

Runoff is medium to rapid, and the hazard of erosion is high. Available water capacity is 7 to 10 inches. Permeability is slow. Effective rooting depth is over 40 inches.

This land is used for range along with surrounding areas, but production is always less and accessibility is limited. Cover is annual grasses, forbs, and occasionally brush. Capability unit VIIe–1(19,15,20); Clayey range site.

Arnold Series

The Arnold series consists of somewhat excessively drained soils on low hills along the Pacific Ocean. The soils formed in material weathered from very soft sandstone. Slope ranges from 9 to 75 percent. Elevation is 20 to 800 feet. Vegetation on gentle slopes is annual grasses, forbs, scattered oak trees, and sagebrush. On north slopes it is dense brush and oak trees and an understory of sparse annual grasses and forbs. Average annual precipitation is 17 to 20 inches. Mean annual air temperature is 59° to 61° F, and the frost free season is 310 to 330 days.

In a representative profile the surface layer is brown loamy sand about 20 inches thick. The next layer is mixed brown, yellow and brown loamy sand about 14 inches thick. The substratum to a depth of 58 inches is brownish yellow loamy sand. Below this is very pale brown, soft weakly consolidated sandstone that extends to a depth of more 60 inches. Reaction is neutral in the upper part and mildly and moderately alkaline in the lower part.

Permeability is rapid. Effective rooting depth is 50 inches or more. Available water capacity is 2.5 to 5.5 inches.

These soils are used for urban development, range, and orchards, or they are idle.

Representative profile of Arnold loamy sand, 9 to 15 percent slopes, on a site under live oaks and annual grasses, approximately 0.6 mile north and 0.4 mile west of the Las Positas-Cliff Drive intersection, at east side of sanitary landfill:

A11—0 to 8 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 3/3) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine interstitial pores and common very fine tubular pores; neutral; abrupt wavy boundary.

A12—8 to 20 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine interstitial pores and common very fine and fine tubular pores; neutral, gradual irregular boundary.

AC—20 to 34 inches, brownish yellow (10YR 6/6) loamy sand mixed with brown (10YR 5/3) very pale brown (10YR 7/4) and dark brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine fine and medium roots; many very fine interstitial pores and few very fine and fine tubular pores; neutral, gradual irregular boundary.

C1—34 to 58 inches, brownish yellow (10YR 6/6) loamy sand yellowish brown (10YR 5/6) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine, fine and medium and coarse roots; many very fine interstitial pores and few very fine and fine tubular pores; mildly alkaline; gradual irregular boundary.

C2—58 to 80 inches; very pale brown (10YR 7/4) weakly consolidated sandstone, light olive brown (2.5Y 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; common coarse roots; many very fine interstitial pores and few very fine and fine tubular pores; slightly effervescent with disseminated lime; moderately alkaline.

The A11 horizon is brown, pale brown, light grayish brown and grayish brown. It is loamy sand, loamy fine sand or sand. The upper 2 to 4 inches may have weak to moderate granular structure, or it may be massive or single grained.

Reaction of the soil is medium acid to mildly alkaline, but in some areas it contains layers that are moderately alkaline and have free lime. The A12 and AC horizons typically are brown, light yellowish brown, or yellowish yellow. In some areas it is very pale brown. In most places the texture of the A12 and AC horizons is the same as the texture in the A11 horizon. In places these horizons have slight clay increases but texture is seldom finer than sandy loam. The A12 and AC horizons are massive or single grained.

The C2 horizon is variable in this series. In some areas it is yellowish brown, soft sand with little or no cementation, and in others it is moderately hard sandstone at a depth of 40 to 70 inches. In some areas it contains red iron stains that tend to darken when exposed to the air.

AgD—Arnold loamy sand, 9 to 15 percent slopes. This strongly sloping soil is on low hills. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of

Ayar, Tierra, and San Andreas soils and concave areas that have a loam or clay loam subsoil. Also included are small eroded areas that have gullies in drainageways.

Runoff is medium, and the hazard of erosion is moderate.

This soil is used for urban development, small orchards, and range, or it is idle. Capability unit IVe–4 (19); Sandy range site.

AgE2—Arnold loamy sand, 15 to 30 percent slopes, eroded. This moderately steep soil is located on low hills. It has a profile similar to the one described as representative of the series, but the surface layer is typically 4 to 6 inches thinner.

Included with this soil in mapping are small areas of Ayar, Tierra, and San Andreas soils. Also included are small areas of soils that have a loam or clay loam subsoil in swales or concave places where deeper weathering has occurred. Some concave places have numerous deep gullies where water has concentrated; others have rills where the vegetation has been removed or overgrazed.

Runoff is medium, and the hazard of erosion is moderate.

This soil is used for urban development and range, or it is idle. Capability unit VIe–1(19); Sandy range site.

AgF2—Arnold loamy sand, 30 to 50 percent slopes, eroded. This steep soil is on low hills. It has a profile similar to the one described as representative of the series, but the surface layer is typically 5 to 10 inches thinner.

Included with this soil in mapping are small areas of Ayar, Tierra, and San Andreas soils. Most drainageways have deep gullies and some side slopes have rills because of overgrazing or removal of vegetation.

Runoff is rapid, and the hazard of erosion is high.

This soil is used for urban development and range, or it is idle. Capability unit VIIe–1(19); Sandy range site.

AgG—Arnold loamy sand, 50 to 75 percent slopes. This very steep soil is on low hills. It has a profile similar to the one described as representative of the series, but the surface layer is typically 5 to 10 inches thinner.

Included with this soil in mapping are small areas of Ayar, Santa Lucia, and San Andreas soils. Because this soil has had little or no changes in its natural vegetation, erosion has been slight.

Runoff is rapid, and the hazard of erosion is very high.

This soil is used for watershed and range. Capability unit VIIe–1(19); Sandy range site.

Ayar Series

The Ayar series consists of well drained soils. The soils formed in material weathered from soft calcareous shale or mudstone. Slope ranges from 15 to 75 percent. Elevation is 100 to 1,000 feet. Vegetation is annual grasses, forbs, and occasional sagebrush. Average annual precipitation is 17 to 20 inches, the mean annual air temperature is 60° to 61° F., and the frost free season is 300 to 330 days.

In a representative profile the surface layer is very dark grayish brown clay about 30 inches thick. The next layer is mixed very dark grayish brown and light yellowish brown clay about 10 inches thick. The substratum is light brownish gray soft marly shale that extends to a depth of 60 inches or more. Reaction is [illegible] throughout.

Potential [illegible] shrink-swell potential on drying and wetting is high.

These soils are subject to landslides. They are used for range, lemons, avocados, and urban development.

Representative profile of Ayar clay, 15 to 30 percent slopes, eroded, on the Corona Del Mar Ranch, approximately ⅜ mile northeast of ranch headquarters near ranch road, about 2 miles northwest of Santa Barbara Airport:

A11—0 to 2 inches; very dark grayish brown (10YR 3/2) clay, very dark brown (10YR 2/2) moist; strong medium granular structure; very hard, friable, very sticky and very plastic; many very fine and fine roots; many very fine interstitial pores; strongly effervescent with disseminated lime, moderately alkaline; abrupt smooth boundary.

A12—2 to 16 inches; very dark grayish brown (10YR 3/2) clay, very dark brown (10YR 2/2) moist; moderate medium subangular blocky and granular structure; very hard, friable, very sticky and very plastic; many very fine and fine roots; many very fine interstitial pores many small, intersecting slickensides; strongly effervescent with disseminated lime; moderately alkaline; clear wavy boundary.

A13ca—16 to 30 inches; very dark grayish brown (10YR 3/2) clay, very dark brown (10YR 2/2) moist; moderate very coarse prismatic structure parting to moderate medium subangular blocky; very hard, very friable, very sticky and very plastic; common very fine and fine roots concentrated along ped faces; few very fine and fine interstitial pores; many small, medium, and large, intersecting slickensides and pressure faces, strongly effervescent with lime, both disseminated and in medium irregularly shaped soft [illegible] moderately alkaline, gradual wavy boundary.

AC—30 to 40 inches; very dark grayish brown (10YR 3/2) clay, very dark brown (10YR 2/2) mixed with light yellowish brown (10YR 6/4) and dark yellowish brown (10YR 4/4) moist; moderate coarse subangular blocky structure; very hard, very friable, very sticky, and very plastic; common very fine roots; few very fine interstitial pores; many small and medium, intersecting slickensides; violently effervescent with disseminated lime; moderately alkaline; gradual irregular boundary.

Cr—40 to 69 inches, light brownish gray (2.5Y 6/2) soft marly shale, dark grayish

brown and olive brown (2.5Y 4/2, 4/4) moist; massive; few very fine roots; moderately alkaline; about 2 percent of parent material is gypsum crystals occurring in seams.

The A horizon is very dark grayish brown, dark grayish brown, brown, and dark brown and has hues of 10YR or 2.5YR. It is typically clay but may be silty clay loam in the transition to C or Cr horizon. The [illegible] structure except in eroded soil areas where this layer may be absent. Thickness of the soil to the Cr horizon ranges from about 10 to 60 inches.

The Cr horizon is light brownish gray, light yellowish brown, light olive gray and olive gray in hues of 10YR, 2.5Y, and 5Y. It is typically soft calcareous or [illegible]

AhE2—Ayar clay, 15 to 30 percent slopes, eroded. [illegible] described as representative of the series. Most of this soil has lost 6 to 20 inches of soil by erosion because of cultivation. In some areas there are knolls and ridge tops where most of the surface layer has been lost to erosion and the substratum is exposed or mixed with the remaining surface layer. The soil in these areas is less than 40 inches thick over the substratum. These areas of severely eroded soils make up about 2 percent of this soil.

Included with this soil in mapping are areas of Zaca, Gaviota, Los Osos, and Diablo soils and a soil similar to Ayar but free of lime.

Runoff is rapid, and the hazard of erosion is high. Available water capacity is about 5.5 to 10 inches. Effective rooting depth is 40 to 60 inches.

This soil is used for range, orchards, and urban development. Capability unit IVe–5 (19,15); Clayey range site.

AhF2—Ayar clay, 30 to 50 percent slopes, eroded. This steep soil is on foothills. It has a profile similar to the one described as representative of the series, but in some places it is 5 to 10 inches shallower to bedrock. About 30 to 40 percent of this soil has lost 10 to 20 inches of material by erosion because of cultivation or overgrazing and is less than 40 inches deep. Rills and gullies are numerous in these areas.

Included with this soil in mapping are small areas [illegible] cluded are a similar soil that is free of lime throughout and other areas of soil that are not cultivated and are not eroded.

Runoff is rapid, and the hazard of erosion is high. Available water capacity is 5.5 to 10 inches. Effective rooting depth is 40 to 60 inches.

This soil is used for range and lemon orchards. Capability unit VIe–1 (19,15); Clayey range site.

AhG—Ayar clay, 50 to 75 percent slopes. This very steep soil is on foothills of the Santa Ynez Mountains. It has a profile similar to the one described as representative of the series, but in most places it is 10 to 20 inches shallower to bedrock. Included in mapping are small areas of Gaviota, Sespe, Todos, [illegible] soils and a similar soil that is free of lime throughout.

This soil is 30 to 40 inches deep to bedrock, which is shallower than defined in the range for the series. The difference, however, does not greatly alter its use and management.

Runoff is very rapid, and the hazard of erosion is high. Available water capacity is 4.0 to 8.5 inches. Effective rooting depth is 30 to 40 inches. This depth is shallower than that recognized for the Ayar soils elsewhere in California.

This soil is used for range. Capability unit VIIe–1 (19, 15); Clayey range site.

Ballard Series

The Ballard series consists of well drained soils on alluvial fans and low terraces. The soils formed in alluvium derived from sedimentary rock. Slope ranges from about 0 to 9 percent. Elevation is 50 to 200 feet. Vegetation is annual grasses, forbs, and large oak trees. Average annual precipitation is 16 to 20 inches, mean annual air temperature is 60° to 62° F., and the frost free season is 310 to 330 days.

In a representative profile the surface layer is dark brown and reddish brown fine sandy loam about 23 inches thick. The subsoil extends to a depth of 60 inches or more. It is reddish brown loam in the upper [illegible] in the upper part and medium acid in the lower part.

Permeability is moderate. Effective rooting depth is over 60 inches.

Ballard soils are used for lemons, avocados, and urban development.

Representative profile of Ballard fine sandy loam, 2 to 9 percent slopes, idle, under grass and weeds, formerly cultivated, approximately 1 mile northwest of Carpinteria, about 1,500 feet east of the intersection of Foothill Road and Cravens Lane, and 150 feet north in field:

Ap—0 to 8 inches; dark brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; moderate medium granular structure; hard, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine interstitial pores, mildly alkaline; numerous krotovinas; clear smooth boundary.

A12—8 to 14 inches; dark brown (10YR 4/3) fine sandy loam mixed with reddish brown (5YR 5/4) by rodent action, dark brown (10YR 3/3) moist; weak medium granu[illegible] friable, slightly [illegible] slightly plastic; common very [illegible] any very fine interstitial and fine tubular pores; medium acid; gradual wavy boundary.

A13—14 to 23 inches; reddish brown (5YR 4/4) fine sandy loam, dark reddish brown (5YR 3/4) moist; weak medium subangular blocky structure, hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine and fine interstitial and tubular pores; strongly acid; clear wavy boundary.

B1t—23 to 31 inches; reddish brown (5YR 4/4)

light loam, dark reddish brown (5YR 3/4) moist; weak medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; very few very fine roots; common very fine interstitial pores and few very fine tubular pores; common thin clay bridges between mineral grains and common thin clay films on ped faces; strongly acid; clear wavy boundary.

B21t—31 to 42 inches; reddish brown (5YR 4/4) stony clay loam, dark reddish brown (5YR 3/4) moist; massive; hard, firm, sticky and plastic; no roots; common very fine interstitial pores; common thin clay films line pores; medium acid; about 30 percent by volume coarse grained sandstone from gravel size to 4 inches in diameter; gradual irregular boundary.

B22t—42 to 60 inches; reddish brown (5YR 4/4) very stony clay loam, dark reddish brown (5YR 3/4) moist; massive; hard, firm, sticky and plastic; no roots; few very fine interstitial pores; many thick clay films line pores; medium acid; about 90 percent by volume coarse grained sandstone from gravel size to 2 feet in diameter.

The A horizon is dark brown, brown, grayish brown or dark grayish brown. It is fine sandy loam or sandy loam and has gravelly spots in some areas. The B horizon is brown or reddish brown and has hues of 7.5YR and 5YR. It has weak subangular blocky structure or it is massive. Texture ranges from loam to clay [illegible] present at the lower part. In some places a C horizon is at a depth of 60 inches. It is [illegible] brown stony or gravelly [illegible] sandy loam. The B horizon has some clay stainings on soil or rock fragments.

Ballard soils in the survey area have a base saturation of less than 75 percent, which is less than defined as the range for the series. This difference, however, does not greatly affect the use and mangement of the soils.

BuA—Ballard fine sandy loam, 0 to 2 percent slopes. This nearly level soil is on alluvial fans. It has a profile similar to the one described as representative of the series, but the lower part of the subsoil in most places does not contain stones or pebbles. Included in [illegible] areas of [illegible] soils.

Runoff is medium, and the hazard of erosion is slight. Available water capacity is 8 to 9 inches.

This soil is used for urban development and lemons. Capability class I (19)

BuC—Ballard fine sandy loam, 2 to 9 percent slopes. This gently sloping and moderately sloping soil is on alluvial fans and low terraces. It has the profile described as representative of the series. Stones and pebbles may not be present in the lower part of the subsoil.

Included with this soil in mapping are small areas of Goleta, Elder, and Botella soils. Also included are small areas of Ballard soils that have slopes slightly more than 9 percent and small areas of moderately to severely eroded Ballard soils.

Runoff is medium, and the hazard of erosion is moderate. Available water capacity is 7 to 8 inches.

The soil is used for lemons, avocados, and urban development. Capability unit IIe–1 (19, 15)

Ballard Variant

The Ballard Variant consists of well drained soils on broad alluvial fans. The soils formed in alluvium derived from sedimentary rock. In most places, slopes are 2 to 9 percent. Elevation is 200 to 500 feet. Vegetation is a dense growth of large oak trees and an understory of grasses and forbs. Average annual precipitation is 16 to 20 inches, mean air temperature is 60° to 62° F., and the frost free season is 310 to 330 days.

In a representative profile the surface layer is grayish brown, stony fine sandy loam and stony loam about 24 inches thick. The subsoil is reddish brown, very stony loam about 11 inches thick. The substratum is brown, very stony loamy sand to a depth of 60 inches or more. Reaction is slightly acid and medium acid in the surface layer and strongly acid below.

Permeability is moderate. Effective rooting depth is more than 60 inches. Available water capacity is 3.5 to 6 inches.

These soils are used for urban development or are idle.

Representative profile of the Ballard variant, stony fine sandy loam, 2 to 9 percent slopes, under grass and oak, in a vacant lot at back of lot 2895 Foothill Road, approximately 950 feet east of intersection of Mission and Foothill Roads.

A11—0 to 3 inches; grayish brown (10YR 5/2) stony fine sandy loam, very dark grayish brown (10YR 3/2) moist; strong medium granular structure; slightly hard, very friable, slightly sticky, and slightly [illegible] many very fine and fine interstitial pores; slightly acid; clear smooth boundary.

A12—3 to 24 inches; grayish brown (10YR 5/2) [illegible] very dark grayish brown (10YR 3/2) moist; weak fine subangular [illegible] structure; slightly hard, very friable, slightly sticky, and slightly plastic; many very fine, fine, medium, and large roots; many very fine interstitial pores and few very fine tubular pores; medium acid; clear irregular boundary.

B2t—24 to 35 inches; reddish brown (5YR 5/3) very stony loam, dark reddish brown (5YR 3/4) moist; weak medium subangular blocky structure; hard, friable, sticky, and plastic; many very fine, fine and common, medium and coarse roots; many very fine interstitial pores; oriented clay occurs as bridges holding mineral grains together; about 75 percent rounded stones and boulders, strongly acid; clear wavy boundary.

C—35 to 60 inches; brown (7.5YR 5/4) very stony loamy sand, dark brown (7.5YR

4/4) moist; massive; soft, very friable, nonsticky and slightly plastic; many very fine and few coarse roots; many very fine and fine interstitial pores; about 75 percent rounded stones and boulders; strongly acid

The A horizon is grayish brown and dark grayish brown stony sandy loam to stony loam. It has moderate or strong granular or fine subangular blocky structure. The B2t horizon is reddish brown, but can be brown. It is fine sandy loam or loam. Structure of the B2t horizon is weak subangular blocky or the horizon is massive. The C horizon varies in content of cobbles, stones, boulders and gravels. It typicaly has more than 50 percent particles larger than sand. In most pedons, the C horizon is loamy sand or sandy loam.

BbC—Bullard Variant, stony fine sandy loam, 2 to 9 percent slopes. This gently sloping to moderately sloping soil is on alluvial fans. Included in mapping are small areas of Milpitas stony fine sandy loam.

Runoff is medium, and the hazard of erosion is light. Stones and boulders make the use of all farm machinery impractical, although some orchards have been planted after removal of some boulders.

This soil is nearly all urbanized. Native cover is dense growth of large oak trees with annual grasses and forbs beneath. Most trees remain except where there are houses or other developments. These areas [illegible] and urban development. Capability unit IVs–7 (19).

Baywood Series

The Baywood series consists of somewhat excessively drained soils. The soils formed in wind-blown deposits on old sand dunes blown from ocean beaches. Slope ranges from 2 to 9 percent. Elevation is 20 to 200 feet. Vegetation is annual grasses, forbs, and brush. Average precipitation is 16 to 20 inches, mean annual air temperature is 59° to 61° F., and the frost free season is about 330 days.

In a representative profile the surface layer is dark grayish brown and grayish brown loamy sand about 33 inches thick. The underlying material to a depth of more than 60 inches is pale brown and light yellowish brown loamy sand. Reaction is neutral throughout.

Permeability is rapid. Available water capacity is [illegible]. Effective rooting depth is more than 60 inches.

Baywood soils are used for lemons, avocados, range, and urban development. Some areas are idle.

Representative profile of Baywood loamy sand, 2 to 9 percent slopes, under annual grasses and brush, at edge of terrace break above the ocean, approximately 2 miles southeast of Carpinteria and 1½ miles behind Rincon Engineering Corp. at 6325 Carpinteria Avenue:

A11—0 to 14 inches; dark grayish brown (10YR 4/2) loamy sand, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine interstitial pores; neutral; clear wavy boundary.

A12—14 to 33 inches; grayish brown (10YR 5/2) loamy sand, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine interstitial pores and very few fine tubular pores; neutral; clear wavy boundary.

C1—33 to 46 inches; pale brown (10YR 6/3) loamy sand, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots, many very fine interstitial pores; neutral; clear wavy boundary.

C2—46 to 62 inches; light yellowish brown (10YR 6/4) loamy sand, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine interstitial pores; neutral

The A horizon is 20 to 41 inches thick. It is grayish [illegible] It is sand and loamy sand, and in places, loamy fine sand. The A11 horizon has weak granular structure; in disturbed areas, this horizon is massive. Reaction of the A horizon is medium acid to neutral. The C horizon is similar to the A horizon, but has less organic [illegible]

BeE—Baywood loamy sand, 2 to 9 percent slopes. [illegible] terraces in scattered areas near the ocean where wind deposits from the beach have covered old terrace soils. Its boundaries are not well defined and depth of deposits is variable. Generally these areas consist of 40 inches to many feet of wind deposited sandy material. Surfaces tend to be hummocky because of wind movement. Included in mapping are about 10 percent Milpitas and Concepcion soils that are thickened by 10 to 40 inches of sandy deposit. Also included are small areas of soils that have slopes of less than 2 percent and others that have slopes of 9 to 15 percent.

Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate to high [illegible] is soil is used for lemons, avocados, range, and urban development, or is idle.

Numerous old Indian campgrounds are on this soil, and [illegible] are marked by special symbols on the soil map. Capability unit IIIe–4 (19,15); Sandy range site.

Beaches

BE—Beaches are narrow, sandy, and stony areas along the Pacific Ocean which are partly or completely covered by water during high tide and exposed during low tide. Along part of the coast, cliffs and bluffs rise abruptly from the ocean causing beaches to be absent or narrow. The stony stretches of beach are mainly at mouths of drainageways and the base of cliffs. Beaches

are not stable; they may change from sandy to stony or from stony to sandy during storms. Beaches have no agricultural value but are used for recreation. Capability unit VIIIw–1 (15, 19).

Botella Series

The Botella series consists of well drained soils on alluvial fans and in small valleys. The soils formed in alluvium derived from sedimentary rock. Slope ranges from 0 to 9 percent. Elevation is 20 to 800 feet. Vegetation is annual grasses, forbs, and scattered oaks. Average annual precipitation is 16 to 20 inches, mean annual air temperature is 59° to 61° F., and the frost free season is 290 to 320 days.

In a representative profile (fig. 2) the surface layer is very dark gray silty clay loam about 20 inches thick. The subsoil is silty clay loam about 23 inches thick. It is very dark gray in the upper part and dark grayish brown in the lower part. The substratum, to a depth of 60 inches, is mixed brown and very dark gray silty clay loam. Below this, it is grayish brown silty clay loam. Reaction is slightly acid in the surface layer becoming neutral to moderately alkaline and calcareous with depth.

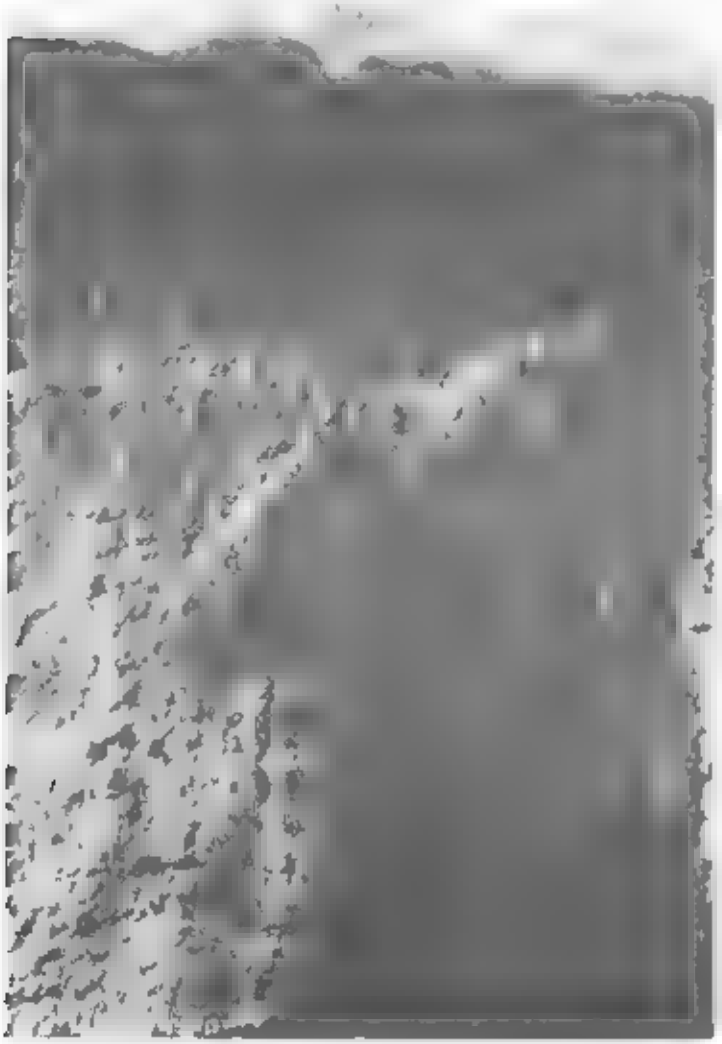

Figure 2.—Profile of Botella silty clay loam. The dark surface layer indicates a high content of organic matter.

Permeability is moderately slow. Effective rooting depth is more than 60 inches.

These soils are used for dryland crops and range.

Representative profile of Botella silty clay loam, 0 to 2 percent slopes, formerly cultivated on a site under annual grasses and forbs, on Hollister Ranch Road leading in to San Augustine Cabana, approximately 150 feet south of railroad tracks and 600 feet west of Cabana:

Ap—0 to 5 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; strong very fine granular structure; hard, firm, sticky and plastic; many very fine and fine roots; many very fine interstitial pores; slightly acid; clear wavy boundary.

A12—5 to 20 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate medium subangular blocky structure; very hard, firm, sticky and [illegible] common very fine and fine roots; common very fine interstitial and tubular pores; slightly acid; clear wavy boundary.

B21t—20 to 33 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots; common very fine interstitial pores and many very fine tubular pores; common thin clay films in pores; neutral; gradual irregular boundary.

B22t—33 to 43 inches; dark grayish brown (10YR 4/2) silty clay loam, mixed with brown (10YR 5/3), black (10YR 2/1) and dark yellowish brown (10YR 3/4) moist; weak coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; very few very fine roots; few very fine tubular pores; common thin clay films in pores and on ped faces; moderately alkaline; gradual irregular boundary.

C1ca—43 to 60 inches; brown (10YR 5/3) silty clay loam mixed with very dark gray (10YR 3/1), dark brown (10YR 3/3) moist; strong medium and coarse prismatic structure; very hard, very firm, very sticky and very plastic; very few very fine roots; few very fine tubular pores; common thin clay films in pores; slightly effervescent, fine irregularly shaped lime in soft masses and large irregularly shaped lime in seams; moderately alkaline; gradual irregular boundary.

C2—60 to 72 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate, medium, angular, blocky structure; very hard, very firm, sticky and plastic; very few very

fine roots; few very fine tubular pores, slightly effervescent, fine irregularly shaped lime in seams, moderately alkaline

The A horizon is dark gray, very dark gray, and has a hue of 10YR. It is typically silty clay loam but there are areas of clay loam and shaly clay loam. The A horizon has strong granular structure near the surface and weak or moderate subangular blocky in the lower part. Reaction is medium acid to neutral. The B2t horizon is dark gray, very dark gray, or dark grayish brown and has a hue of 10YR. It is heavy silty clay loam, clay loam, or shaly clay loam. Structure is moderate or weak subangular blocky or weak prismatic. Reaction is neutral to moderately alkaline. The C horizon is grayish brown or brown silty clay loam, clay loam, or shaly clay loam. Reaction is moderately alkaline.

BgA—Botella silty clay loam, 0 to 2 percent slopes. This nearly level soil is in small valleys that terminate at the ocean. It has the profile described as representative of the series. Included in mapping are small areas of shaly Botella soils and areas that are loam or clay loam throughout.

Runoff is medium, and the hazard of erosion is slight. Available water capacity is 9.5 to 11.5 inches.

This soil is used for dryland grain, hay, and pasture. Capability class 1(19), capability unit IIc–1(15); Clayey range site.

BgC—Botella silty clay loam, 2 to 9 percent slopes. This gently sloping and moderately sloping soil is in narrow valleys that terminate at the ocean (fig. 3). During heavy rains, this soil is occasionally overflowed by runoff from adjoining hills and terraces. Included with this soil in mapping are small areas of Concepcion and shaly Botella soils. Also included are small areas of soils that have slopes of 9 to 15 percent.

Runoff is medium, and the hazard of erosion is moderate. Available water capacity is 9.5 to 11.5 inches.

This soil is used for dryland grain, hay, and pasture. Capability unit IIe–1 (19, 15); Clayey range site.

BhC—Botella shaly clay loam, 2 to 9 percent slopes. This gently sloping to moderately sloping soil is in small narrow valleys that terminate at the ocean. It has a profile similar to the one described as representative of the series, but the surface layer is 15 to 25 percent shale fragments. The subsoil and substratum in most places is 5 to 10 percent shale fragments, by volume. This soil is occasionally overflowed by runoff from higher areas with some scouring and deposition. Included with this soil in mapping are areas of soils that are nearly free of shale and small areas of Santa Lucia soils.

Runoff is medium, and the hazard of erosion is moderate. Available water capacity is 8 to 10 inches.

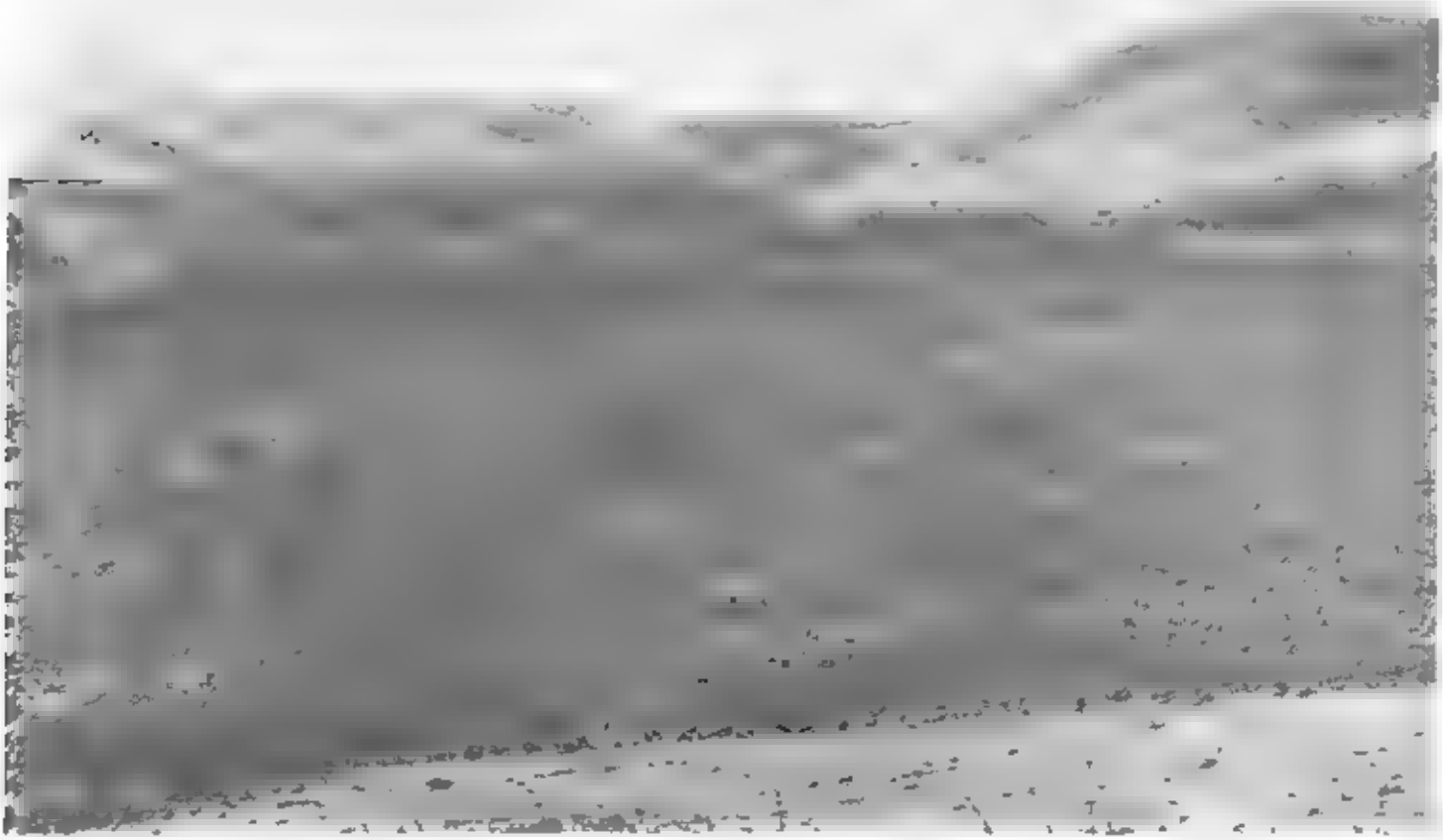

Figure 3.—This Botella silty clay loam, 2 to 9 percent slopes, is in a small coastal valley between Concepcion soils on terraces.

This soil is used for dryland grain, hay, and pasture. Capability unit IIe–1 (19, 15); Clayey range site.

Botella Variant

The Botella Variant consists of well drained soils on alluvial fans. The soils formed in alluvium derived from sedimentary rock. Slope ranges from 2 to 15 percent. Elevation is 100 to 500 feet. Vegetation is annual grasses, forbs, and scattered oaks. Average annual precipitation is 15 to 20 inches, mean annual air temperature is 60° to 62° F., and the frost free season is 300 to 330 days.

In a representative profile the surface layer is about 30 inches thick. The upper 7 inches is dark reddish gray silty clay loam and the lower [illegible] brown clay loam. The subsoil is dark reddish gray and reddish clay loam. The subsoil is dark reddish gray and reddish brown clay loam about 43 inches thick. The substratum is reddish brown clay loam to a depth of 60 inches or more. Reaction is medium acid to neutral in the surface layer becoming moderately alkaline and slightly calcareous with depth.

Permeability is moderately slow. Available water capacity is 9.5 to 12 inches, and effective rooting depth is more than 60 inches.

These soils are used for lemons, avocados, range, and urban development.

Representative profile of the Botella variant silty clay loam, 2 to 9 percent slopes, eroded, on an idle previously cultivated site under grass and weeds, approximately 2 miles northwest of Carpinteria, about 120 feet north of Foothill Road, 190 feet west of rear entrance to polo grounds.

Ap—0 to 7 inches; dark reddish gray (5YR 4/2) silty clay loam, dark reddish brown (5YR 3/2) moist; weak medium granular structure; hard, friable, sticky and plastic; many very fine, fine, and medium roots; many very fine and fine interstitial pores; medium acid; clear wavy boundary.

A12—7 to [illegible] inches; reddish brown (5YR 4/3) clay loam, dark reddish brown (5YR 3/3) moist; [illegible] hard, friable, sticky and plastic; common very fine roots; many very fine and fine interstitial pores and common very fine tubular pores; neutral; gradual wavy boundary.

B21—[illegible] to [illegible] inches, dark reddish gray (5YR 4/2) [illegible] dark reddish brown (5YR 3/2) moist; moderate medium subangular blocky structure; very hard, firm, very sticky and plastic; few very fine roots; many very fine and fine interstitial pores; neutral; gradual wavy boundary.

B22t—55 to 73 inches; reddish brown (5YR 4/3) clay loam, dark reddish brown (5YR 3/3) moist; weak coarse angular blocky structure, very hard, firm, very sticky and plastic; few very fine roots, few very fine tubular pores; many thin clay films on ped faces and lining tubular and interstitial pores; very slightly effervescent disseminated lime at 69 inches; moderately alkaline; clear wavy boundary.

C—73 to 80 inches; reddish brown (5YR 4/3) clay loam, dark reddish brown (5YR 3/4) moist; massive, hard, firm; sticky and plastic; very few very fine roots; common very fine interstitial pores; slightly effervescent disseminated lime; moderately alkaline.

The A horizon is dark reddish gray, reddish brown, or dark reddish brown and has a hue of 5YR. It is typically clay loam, but there are areas of loam. Reaction is medium acid to neutral. The B2t horizon is dark reddish gray, reddish brown, or dark reddish brown and has a hue of 5YR. It is clay, clay loam, or silty clay loam. It has an angular or subangular blocky structure. The C horizon ranges from reddish brown to dark reddish brown and has a hue of 5YR. The red colors in this soil are an inherited characteristic of the parent material. This soil formed in alluvium washed from the red Sespe Formation.

BkC2—Botella Variant silty clay loam, 2 to 9 percent slopes, eroded. This gently sloping and moderately sloping soil is in narrow valleys and on fans. It has the profile described as representative of the variant. This soil is subject to overflow by runoff from adjoining hills, and gullies have formed in many places. Included in mapping are small areas of Goleta and Todos soils.

Runoff is medium, and the hazard of erosion is moderate. The hazard of channel cutting by meandering streams is moderate.

This soil is used for lemons, avocados, range, and [illegible] (Capability unit IIe–1), Clayey range site.

BkD2—Botella Variant silty clay loam, 9 to 15 percent slopes, eroded. This strongly sloping soil is on alluvial fans. It has a profile similar to the one described as representative of the variant. This soil is [illegible] gullies have formed in many places. Included in mapping are small areas of Goleta and Todos soils.

Runoff is medium, and the hazard of erosion is moderate.

This soil is used for lemons, avocados, range, and [illegible] (Capability unit IIIe–1), Clayey range site.

Camarillo Series

The Camarillos series consists of poorly drained soils on flood plains. These soils formed in stratified alluvium derived from calcareous sedimentary rock. Slopes are 0 to 2 percent. Vegetation is water-tolerant grasses, forbs, willow, and tules. Elevation is 10 to 50 feet. Average rainfall is 15 to 20 inches, average mean air temperature is 60° to 62° F., and the frost free season is 310 to 330 days.

In a representative profile the surface layer is brown, calcareous fine sandy loam about 11 inches thick. The underlying material is stratified brown and pale brown, calcareous, mottled fine sandy loam, loamy sand, sandy loam, loam, and clay loam to a depth of 60 inches or more. Reaction is moderately alkaline throughout.

Permeability is moderate. If these soils are drained,

effective rooting depth is 60 inches or more, and available water capacity in 7 to 9.5 inches.

These soils are used for lemons, field crops, and urban development.

Representative profile Camarillo fine sandy loam on a site under heavy cover of annual grasses and assorted salt-tolerant plants in the Goleta area, approximately 350 feet east of Ward Drive and 1,000 feet north of Atascadero Creek

Ap—0 to 11 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few, medium and common, very fine and fine roots; common, very fine, fine, and medium tubular pores and many very fine and fine interstitial pores; strongly effervescent with disseminated lime; moderately alkaline; clear smooth boundary.

C1—11 to 19 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; few, fine, prominent, yellowish red (5YR 4/6) moist mottles; massive; slightly hard, very friable, slightly sticky and slightly plastic; few, medium and common, very fine and fine roots; many very fine interstitial pores; strongly effervescent with disseminated lime; moderately alkaline; about 2 to 3 percent salt crystals or gypsum in threads or filaments; abrupt smooth boundary.

C2—19 to 30 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; massive, hard, friable, sticky and slightly plastic; few very fine, fine, and medium roots; common very fine and fine interstitial pores; strongly effervescent with disseminated lime; moderately alkaline; about 3 to 5 percent salt crystals or gypsum in threads or filaments; pieces of charcoal; abrupt smooth boundary.

C3—30 to 37 inches; pale brown (10YR 6/3) loamy sand, yellowish brown (10YR 5/4) [illegible] lowish red (5YR 5/6), dry and moist mottles; massive; slightly hard, very friable, nonsticky and nonplastic; few medium and very few very fine and fine roots; many very fine interstitial pores; strongly effervescent with disseminated lime; moderately alkaline; about 3 to 5 percent salt crystals or gypsum threads or filaments; clear smooth boundary.

C4—37 to 44 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; common, medium, prominent, yellowish red (5YR 5/6 and 5/8) mottles; reddish brown (5YR 5/4) and yellowish red (5YR 5/6) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; few medium and very few very fine roots; common fine and many very fine interstitial pores; strongly effervescent with disseminated lime; moderately alkaline; abrupt smooth boundary.

C5—44 to 57 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; few, medium, prominent, yellowish red (5YR 5/6), dry and moist mottles; massive; hard, friable, sticky and plastic; few medium and very few very fine roots; few fine and very fine tubular pores, violently effervescent with disseminated lime; moderately alkaline; clear smooth boundary.

C6—57 to 70 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few medium and very few very fine roots; common very [illegible] fine tubular pores, slightly effervescent with disseminated lime; moderately alkaline; pieces of charcoal; water table at 70 inches

The A horizon is brown or grayish brown fine sandy loam, but can be sandy loam, loam or loamy sand. The C horizon varies widely in color and texture because of stratification. It is brown, grayish brown, dark [illegible] brown, and yellowish red colors. Texture is sand to clay loam. Gypsum and salt crystals may be present in the C horizon

Ca—Camarillo fine sandy loam. This nearly level soil is on low positions a few feet above sea level. Included in mapping are areas of soils that have a water table at a depth of 1 to 2 feet during the winter. Some of these areas are ponded during prolonged rain. Also included are areas of loamy sand near stream channels and areas of Goleta fine sandy loam.

Runoff is very slow, and the hazard of overflow is moderate. Effective rooting depth is 60 inches or more if drained; however, the water table is at a depth of 3 to 6 feet. Unless protected, most areas are subject to [illegible] deposition. Most areas have slight to moderate salinity in the subsoil

This soil is used for orchard and field crops, but production is spotty and erratic. Some areas are urbanized, but poor surface drainage and the high water table make living conditions less desirable than higher areas. Capability unit IIIw-2(19).

Camarillo Variant

The Camarillo Variant consists of poorly drained soils on low flood plains formed in deposits of loamy stratified alluvium derived from calcareous rock, 24 to 40 inches thick over clay. Slopes are 0 to 2 percent. Vegetation is water-tolerant grasses, forbs, willows, and tules. Elevation is 10 to 50 feet. Average precipitation is 15 to 20 inches, mean annual air temperature is 60° to 62° F., the frost free season is 310 to 330 days.

In a representative profile the surface layer is brown fine sandy loam about 7 inches thick. The underlying material to a depth of 35 inches is stratified brown, grayish brown, and light reddish brown, mottled, sandy loam and sandy clay loam. Below this is brown clay that extends to a depth of 60 inches or more. Reaction is moderately alkaline and calcareous throughout.

Permeability is slow. If these soils are drained, effec-

tive rooting depth is 60 inches or more. Available water capacity is 6.5 to 10 inches.

These soils are used for lemons, field crops, and urban development

Representative profile of the Camarillo variant fine sandy loam, approximately 150 feet east of Craven Lane, 80 feet north of Via Real, in lemon grove about 1 mile west of Carpinteria

Ap—0 to 7 inches; brown (10YR 5/3) fine sandy loam, dark brown (7.5YR 3/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many roots of all sizes; many very fine and fine interstitial pores and many very fine, fine, and coarse tubular pores; slightly effervescent with disseminated lime, moderately alkaline; abrupt smooth boundary.

C1—7 to 12 inches; brown (10YR 5/3) sandy loam, dark brown (7.5YR 3/2) moist, massive; hard, friable, slightly sticky and slightly plastic; few very fine, fine, and coarse roots; many very fine interstitial pores; slightly effervescent with disseminated lime; moderately alkaline; abrupt smooth boundary.

C2—12 to 19 inches; brown (10YR 5/3) sandy loam, dark reddish brown (5YR 3/3) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine, fine, and coarse roots; many very fine interstitial pores and few very fine tubular pores; strongly effervescent with disseminated lime; moderately alkaline; abrupt wavy boundary

C3—19 to 28 inches; grayish brown (10YR 5/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; common medium prominent yellowish red (5YR 5/6) mottles, dark red (2.5YR 3/6) moist; massive; hard, firm, sticky and plastic, common coarse roots and many very fine and fine roots; common very fine tubular pores and many very fine interstitial pores; strongly effervescent with disseminated lime; moderately alkaline; gradual wavy boundary.

C4—28 to 35 inches; light reddish brown (5YR 6/3) sandy loam, dark reddish brown (5YR [illegible] moist; [illegible] (10YR 5/2) mottles, very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common medium and very fine roots; common fine tubular pores; strongly effervescent with disseminated lime; moderately alkaline; water table at 32 inches; abrupt smooth boundary.

IIC5—35 to 72 inches; brown (10YR 5/3) clay, dark brown (10YR 3/3) moist; massive; extremely hard, very firm, very sticky and very plastic; no roots and no pores; slightly effervescent with disseminated lime; moderately alkaline.

The A horizon is brown or grayish brown fine sandy loam, but varies widely and includes loamy sand, sandy loam and loam. The C horizon is stratified loamy sand to [illegible] It is [illegible] with reddish brown or yellowish red mottles. Depth to the IIC horizon ranges from about 24 to 40 inches.

Cb—Camarillo Variant, fine sandy loam. This nearly level soil is on low alluvial plains. Internal drainage is slow, and during winter rainwater may stand on the surface. The water table is 3 to 6 feet from the surface in summer and in fall and 1 to 2 feet from the surface in winter and in spring. Most areas are subject to overflow and damaging deposition if unprotected. Salinity is slight to moderate. Included in mapping are soils [illegible] that are more than 40 inches thick over clay.

Runoff is very slow, and the hazard of overflow is moderate.

This soil is used for lemons and field crops, but production is spotty and erratic (fig. 4). Some areas are urbanized but have severe problems with ponding and septic tanks. Capability unit IIIw-2(19).

Capitan Series

The Capitan series consists of well drained soils on upland areas. The soils formed in calcareous shaly conglomerate. Slope ranges from 30 to 75 percent. Elevation is 100 to 1,000 feet. Vegetation is brush, annual grasses, and forbs. Average annual precipitation is 16 to 20 inches, mean annual air temperature is 60° to 62° F., and the frost free season is 310 to 330 days.

In a representative profile the surface layer is gray cobbly and very cobbly clay loam about 17 inches [illegible] The [illegible] is white calcareous [illegible] and strongly calcareous. Permeability is moderate.

These soils are used for range and watershed

Representative profile of Capitan cobbly clay loam, 30 to 50 percent slopes, on a site under annual grasses, forbs, and sagebrush used for range, approximately 2,000 feet north of U.S. Highway 101 on edge of oil [illegible] about 1 mile west of L. Capitan Beach State Park entrance road:

A11—0 to 4 inches; gray (10YR 5/1) very cobbly [illegible] very dark gray (10YR 3/1) moist; moderate fine and medium granular structure; hard, friable, sticky and slightly plastic; common fine roots; many very fine interstitial pores; about 25 percent by volume coarse fragments, 75 percent of which are 3 to 10 inches in diameter and 25 percent are less than 3 inches; violently effervescent with disseminated lime; moderately alkaline; clear wavy boundary.

A12—4 to 17 inches; gray (10YR 5/1) very cobbly [illegible] very dark gray (10YR 3/1) moist; moderate fine and medium granular structure; hard, friable, sticky and slightly plastic; many very fine roots; many very fine interstitial pores; about 50 percent by volume coarse fragments, 75 percent of which are 3 to 10 inches in diameter and 25 percent are less than 3 inches, violently effervescent with

Figure 4.—Lemon orchard in decline on poorly drained Camarillo very fine sandy loam.

disseminated lime; moderately alkaline; abrupt wavy boundary.

C—17 to 30 inches; white (10YR 8/1) shaly conglomerate with many hard limestone cobbles and pebbles intermixed with soft marly shale.

The A horizon is gray or dark gray and has chroma of less than 2. It is clay loam or silty clay loam. It is moderately alkaline and strongly calcareous throughout. It has moderate or strong granular structure. The A horizon is 25 to 65 percent by volume fragments of conglomerate or calcareous shale and is 2 to 4 percent organic matter. It rests directly on soft calcareous conglomerate or shale at a depth of 4 to 18 inches.

CeF—Capitan cobbly clay loam, 30 to 50 percent slopes. The steep soil is in narrow, irregular bands that parallel the Pacific Ocean within one-half mile of the coastline. It has the profile described as representative of the series. Outcrops of rock, cobbles, and large boulders cover 10 to 15 percent of the surface. Included in mapping are small areas of Santa Lucia, Lopez, and Linne soils and small areas of soils that have slopes of 15 to 30 percent.

Runoff is rapid, and the hazard of erosion is high. Available water capacity is 0.5 to 2.5 inches. Effective rooting depth is 6 to 18 inches.

This soil is used for watershed and limited grazing. Capability unit VIIe–1 (19, 15); Shallow loamy range site.

CdG—Capitan-Rock outcrop complex, 50 to 75 percent slopes. This very steep complex is in narrow bands paralleling the Pacific Ocean within three-fourths of a mile of the coastline. It is about 60 percent Capitan cobbly clay loam and 30 percent Rock outcrop. The rest is Santa Lucia, Lopez, and Linne soils. Capitan soil is on some of the smoother, less sloping areas. Rock outcrop is mainly very steep exposures of hard, massive conglomerate that has a high content of lime. The profile of Capitan soil is similar to the one described as representative of the series, but it typically is 2 to 6 inches shallower to bedrock. Rock outcrop has the characteristics in the description for Rock outcrop.

Runoff on Capitan soil is very rapid, and the hazard of erosion is very high. Available water capacity is 0.5 to 2.0 inches, and effective rooting depth is 4 to 16 inches on Capitan soil.

This complex is used for watershed and very limited grazing. Capability unit VIIs–1 (19,15); Shallow loamy-Rock outcrop complex range site.

Concepcion Series

The Concepcion series consists of moderately well drained soils on low terraces that parallel the coastline

(fig. 5). They formed in mixed alluvium. Slope ranges from 0 to 50 percent. Elevation is 40 to 200 feet. Vegetation is annual grasses and forbs. Average annual precipitation is 16 to 20 inches, the mean annual air temperature is 59° to 61° F., and the frost free season is 310 to 330 days.

In a representative profile the surface layer is grayish brown fine sandy loam about 19 inches thick. The subsurface layer is light brownish gray fine sandy loam 4 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is dark yellowish brown and dark reddish brown clay about 14 inches thick, and the lower part is brownish yellow heavy clay loam. Reaction is strongly acid in the upper part and medium acid in the lower part. Permeability is very slow.

These soils are used for range, urban development, and dryfarm grain or hay.

Representative profile of Concepcion fine sandy loam, 2 to 9 percent slopes, eroded, in a formerly cultivated area on Hollister Ranch under weedy growth and annual grasses and forbs, 0.6 mile west of San Augustine Beach exit on Rancho Real, about 60 feet south of road:

Ap—0 to 5 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine interstitial pores; strongly acid; clear wavy boundary.

A12—5 to 19 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine interstitial and tubular pores; strongly acid; clear wavy boundary.

A2—19 to 23 inches, light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine interstitial and tubular pores; strongly acid; very abrupt smooth boundary.

B21t—23 to 30 inches; dark yellowish brown (10YR 4/4) clay mottled with reddish brown (5YR 4/3), dark yellowish brown (10YR 3/4) mottled with dark reddish brown (5YR 3/3) moist; strong coarse prismatic structure; extremely hard, very firm, very sticky and very plastic; few very fine roots; few very fine tubular and common very fine interstitial pores; continuous thick clay films in pores; strongly acid; clear wavy boundary.

B22t—30 to 37 inches; dark reddish brown (5YR 3/2) clay mottled with reddish brown (5YR 4/4), dark reddish brown (2.5YR 3/4) moist; moderate medium and coarse angular blocky structure; very hard, firm, very sticky and very plastic; very few very fine roots; few very fine interstitial pores; continuous thick clay films on ped faces, many thick clay films in pores; strongly acid; gradual irregular boundary.

B3—37 to 61 inches; brownish yellow (10YR 6/6)

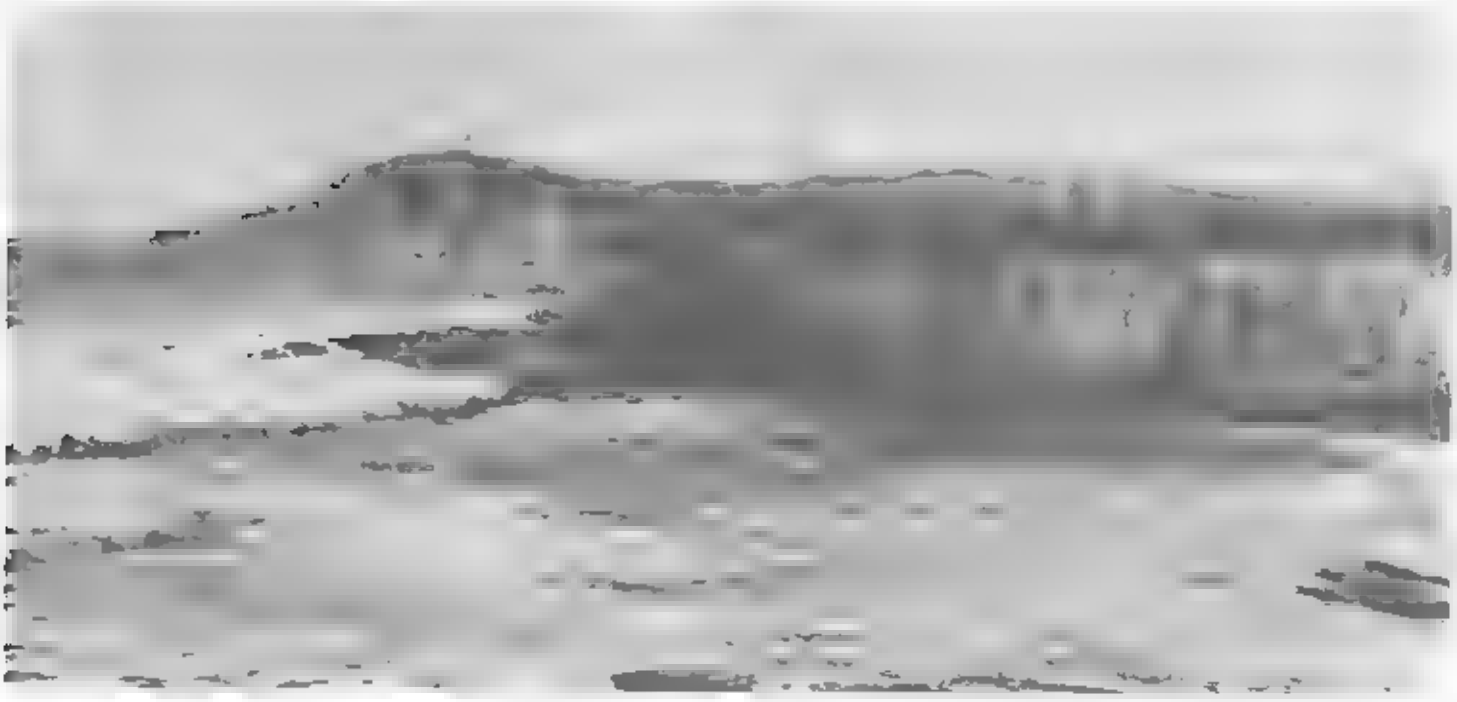

Figure 5.—Windblown sandy deposit capping Monterey Shale. Concepcion soils formed in this deposit. Point Concepcion is in the background, and the Pacific Ocean is in the foreground.

heavy clay loam, yellowish brown (10YR 5/6) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; very few very fine roots; common very fine interstitial pores; many thick clay films on ped faces, common moderately thick clay films in pores; medium acid.

The A horizon is grayish brown, brown, or dark grayish brown and has a hue of 10YR. It is typically fine sandy loam, but in places it is loam or loamy sand. Under natural conditions, in most places, it has weak blocky or weak, granular structure. If cultivated it may be massive. Reaction ranges from slightly acid to strongly acid.

The A2 horizon has a hue of 10YR and is light brownish gray, but in places it is light gray, light brownish gray, pale brown, or very pale brown. Reddish mottles and small manganese concretions are present in some profiles. Texture is the same as the texture in the A1 horizon.

The B2t horizon is typically mixed dark yellowish brown, dark brown, and very dark grayish brown and has hues of 10YR and 5YR. In places as much as 30 to 40 percent of the matrix color is composed of prominent mottles. Structure is generally strong prismatic to moderate or moderate angular blocky. Reaction is strongly acid to medium acid.

The B3 or C horizon is stratified alluvial or windblown deposits that range from loamy sand to heavy clay loam. In places the alluvial deposits are as much as 15 percent shale fragments. The windblown deposits are free of coarse fragments. Reaction is medium acid to moderately alkaline.

CeB—Concepcion loamy sand, 0 to 5 percent slopes. This nearly level to gently sloping soil is on terraces adjacent to the ocean. It has a profile similar to the one described as representative of the series, but the surface layer is loamy sand.

Included with this soil in mapping are small areas of Baywood soils and areas of Dune land. Also included are areas of soils that have a surface layer of sandy loam.

Permeability is very slow, and a perched water table forms above the clay subsoil after a heavy or prolonged rain. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is severe if vegetation is removed. Available water capacity is 2 to 5 inches, and effective rooting depth is 20 to 50 inches.

This soil is used for range. In areas that have been cultivated, gullies as much as 6 feet deep have formed and severe soil blowing has occurred. Capability unit IVe-1(15), Claypan range site.

CgA—Concepcion fine sandy loam, 0 to 2 percent slopes. This nearly level soil is on low terraces in a narrow band paralleling and adjacent to the ocean. It has a profile similar to the one described as representative of the series, but it is 2 to 6 inches deeper to dense clay subsoil. In areas along the coastal cliffs, deep gullies have formed and extend into this soil. Included in mapping are areas of Baywood, Diablo, and Milpitas soils and small areas near the coast that have sandy wind blown deposits as much as 10 inches thick covering the surface. Also included are areas that have a surface layer of loam.

Runoff is slow, and the hazard of erosion is slight. Available water capacity is about 4 to 6 inches, and effective rooting depth is 20 to 26 inches. Some water is available to plants from a thin film that develops above the clay subsoil.

This soil is used for range and urban development. Capability unit IIIs-3 (19); Claypan range site.

CgC—Concepcion fine sandy loam, 2 to 9 percent slopes. This gently sloping to moderately sloping soil is on low terraces in a narrow band paralleling and adjacent to the ocean. It has a profile similar to the one described as representative of the series, but it is 2 to 4 inches deeper to a dense clay subsoil. In areas along the coastal cliffs, deep gullies have formed and extend into this soil.

Included with this soil in mapping are areas of Baywood, Diablo, and Milpitas soils and small areas near the coast that have sandy, wind-blown deposits as much as 10 inches thick covering the surface. Also included are areas that have a surface layer of loam.

Runoff is medium, and the hazard of erosion is moderate. Available water capacity is about 4 to 6 inches, and effective rooting depth is 20 to 26 inches. Some water is available to plants from a thin film that develops at the top of the clay subsoil.

This soil is used for range and urban development. Capability unit IIIe-3(19, 15); Claypan range site.

CgC2—Concepcion fine sandy loam, 2 to 9 percent slopes, eroded. This gently sloping to moderately sloping soil is on low terraces in narrow bands paralleling the ocean. It has the profile described as representative of the series. Most areas have been cultivated and contain numerous gullies and rills. Gullies, as much as 50 feet deep, commonly extend a few feet to several hundred feet into these terraces.

Included with this soil in mapping are areas of Baywood, Diablo, Milpitas, and Positas soils and small areas of soils that are uneroded to slightly eroded.

Runoff is medium, the hazard of erosion is moderate. Available water capacity is about 2 to 4 inches, and effective rooting depth is 12 to 22 inches. Some water is available to plants from a film that develops above the clay subsoil.

This soil is used for range, urban development, dryfarm grain, and hay. Capability unit IVe-3(19, 15); Claypan range site.

CgD2—Concepcion fine sandy loam, 9 to 15 percent slopes, eroded. This strongly sloping soil is along drainageways that have dissected old terraces. It has a profile similar to the one described as representative of the series, but it is typically 2 to 3 inches shallower to the dense clay subsoil. Most areas contain deep gullies in the drainageways and gullies and rills on side slopes above the drainageways.

Included with this soil in mapping are areas of Baywood, Diablo, Milpitas, and Positas soils and small areas of soils that are not eroded or are slightly eroded.

Runoff is rapid, and the hazard of erosion is high. Available water capacity is about 2 to 4 inches, and effective rooting depth is 10 to 20 inches. Some water is available to plants from a water film that develops on the top of the clay subsoil.

This soil is used for range and urban development. Capability unit VIe-1 (19, 15); Claypan range site.

CgE2—Concepcion fine sandy loam, 15 to 30 percent slopes, eroded. This moderately steep soil is on terrace breaks along drainageways. It has a profile similar to the one described as representative of the series, but it is 3 to 6 inches shallower to dense clay subsoil. Deep-fluted gullies are common in the bottom of the drainageways and on side slopes.

Included with this soil in mapping are areas of Milpitas, Positas, and Santa Lucia soils and small areas of soils that are not eroded or are slightly eroded.

Runoff is rapid, and the hazard of erosion is very high. Available water capacity is 1.5 to 4 inches, and effective rooting depth is 8 to 20 inches. Some water is available to plants from a water film that develops over the dense clay subsoil.

This soil is used for range. Capability unit VIe-1 (15, 19); Claypan range site.

CgF2—Concepcion fine sandy loam, 30 to 50 percent slopes, eroded. This steep soil is on side slopes of large entrenched drainageways. It has a profile similar to the one described as representative of the series, but it is 6 to 10 inches shallower to a dense clay subsoil. Deep-fluted gullies are numerous.

Included with this soil in mapping are areas of Lopez, Milpitas, and Tierra soils and areas of soils that are very severely eroded. In some spots the clay subsoil is exposed.

Runoff is very rapid, and the hazard of erosion is very high. Available water capacity is 1.5 to 4 inches, and effective rooting depth is 6 to 18 inches. Some moisture is available to plants from a film that develops above the clay subsoil.

This soil is used for range. Capability unit VIIe-1 (15); Claypan range site.

Cortina Series

The Cortina series consists of somewhat excessively drained soils on alluvial fans adjacent to stream channels. Slope ranges from 2 to 9 percent and occasionally higher. Elevations are 100 to 400 feet. Vegetation is large oak and sycamore trees and an understory of brush, annual grasses, and forbs. Average annual precipitation is 16 to 20 inches, mean annual air temperature is 60° to 62° F., and the frost free season is 310 to 330 days.

In a representative profile the surface layer is brown, stony loamy sand about 9 inches thick. The underlying material is stratified very dark grayish brown and pale brown, stony sandy loam and gravelly loamy sand. Reaction throughout the profile ranges from medium acid to moderately alkaline.

Permeability is rapid. Available water capacity is 2 to 4 inches, and effective rooting depth is 60 inches or more.

Cortina soils are used for urban development or are idle.

Representative profile of Cortina stony loamy sand, 2 to 9 percent slopes, on a site under sycamore and live oak trees, poison oak, and other perennial brush and annual grasses and forbs, approximately 2,100 feet north of U.S. Highway 101 and 300 feet east of Olive Mill Road, near west edge of Montecito Creek by footbridge:

C1—0 to 9 inches; brown (10YR 5/3) stony loamy sand, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; many medium and common fine and very fine roots; many very fine and fine interstitial pores; 3 to 15 percent of surface covered with cobbles, stones, and boulders; moderately alkaline; clear wavy boundary.

C2—9 to 44 inches; very dark grayish brown (10YR 3/2) stony sandy loam, very dark brown (10YR 2/2) moist; massive; soft, very friable, slightly sticky and slightly plastic; many roots of all sizes; many very fine interstitial pores and common very fine and fine tubular pores; 50 to 70 percent gravels, stones, and boulders with 80 percent over 3 inches in diameter; neutral; clear wavy boundary.

C3—44 to 60 inches, pale brown (10YR 6/3) gravelly loamy sand, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine interstitial pores; 30 to 50 percent gravels, cobbles, stones, and boulders with about 50 percent over 3 inches in diameter; medium acid.

Color, texture, and reaction throughout the profile are variable because of stratification. Color is pale brown to very dark grayish brown and has a hue of 10YR, a value of 3 to 6, and a chroma of 2 or 3. Texture typically is sandy loam but the profile may contain layers of loamy sand or sand. Gravel, cobbles, stones, and boulders usually occupy 30 to 80 percent by volume of most layers. Coarse fragments range from gravel size to about 6 feet in diameter and are water-rounded sandstone. Reaction is unpredictable, ranging from medium acid to moderately alkaline. Buried dark A horizons are in some areas.

ChC—Cortina stony loamy sand, 2 to 9 percent slopes. This gently sloping to moderately sloping soil is along major stream channels. In most places the surface layer and underlying material are light grayish brown or brown and commonly grayish brown loamy sand that has numerous stones and boulders on the surface and throughout the profile. Stones and boulders range from a few inches to 6 feet in diameter. Included in mapping are small areas of Ballard fine sandy loam, Milpitas stony fine sandy loam, Riverwash, and small areas that have slopes of 9 to 15 percent.

Runoff is medium, and the hazard of overflow is moderate to high.

This soil is mainly used for urban development or is left idle. A few areas are used for growing avocados or lemons, but stones are so numerous that management is difficult. Capability unit IVw 2(19).

Crow Hill Series

The Crow Hill series consists of well drained soils on uplands. The soils formed in soft, diatomaceous shale. Slope ranges from 9 to 75 percent. Elevation is 300 to 1,600 feet. Vegetation is annual grasses, forbs, and scattered oak trees on moderately steep areas. Brush and scattered scrub oak grow on the steep or severely eroded areas and on north slopes. Average annual precipitation is 16 to 20 inches, mean annual air temperature is 58 to 60° F, and the frost free season is 290 to 325 days.

In a representative profile the surface layer is gray silty clay loam about 28 inches thick. The subsoil is grayish brown silty clay loam that is soft, and the fractured diatomaceous shale at a depth of 35 inches. Reaction is strongly acid throughout.

Permeability is moderately slow.

The Crow Hill soils are used for range and dryland hay and grain. In many places the deposits of diatoms are several hundred feet thick and are quite pure. There is large-scale mining on several thousand acres in this deposit. The diatomaceous materials are used for many industrial purposes.

Representative profile of Crow Hill silty clay loam, 9 to 15 percent slopes, eroded, on a site under ferns, deer vetch, baccharis, California sage, scattered scrub oak and sparse annual grass cover, on Johns-Manville Quarry property, approximately ¾ mile south of entrance on Miguelito Road, about ⅛ mile east on private access road on roadbank, about 8 miles south of Lompoc:

A11—0 to 3 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; strong fine granular structure; slightly hard, very friable, sticky and plastic; many very fine and fine roots, many very fine and fine interstitial pores; 2 percent by volume fine shale fragments; slightly acid; clear wavy boundary.

A12—3 to 18 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; [illegible] moderate medium subangular blocky structure parting to weak fine granular; hard, very friable, sticky and plastic; many very fine, fine, medium and coarse roots, many very fine interstitial pores and few very fine, fine, medium, and coarse tubular pores; 2 percent by volume fine shale fragments; strongly acid; clear wavy boundary.

A13—18 to 28 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, very friable, sticky and plastic; common very fine, fine, medium, and coarse roots, many very fine and fine interstitial pores; 2 percent by volume fine shale fragments; strongly acid; clear smooth boundary.

B2—28 to 31 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to moderate fine granular; slightly hard, very friable, sticky and plastic; few very fine and fine and common medium and coarse roots; many very fine interstitial pores; few thin clay films line tubular or interstitial pores; 15 percent by volume fine shale; strongly acid; clear irregular boundary.

Cr—31 to 35 inches; white (10YR 8/1) brittle and fractured diatomaceous shale that has a bulk density of less than 1; few thin dark brown clay films on upper part of fractured shale; roots abundant along cleavage planes of shale.

The A horizon typically is gray and in a few places is dark gray silt loam or silty clay loam. It has granular or subangular blocky structure. Normally a weak B horizon is above the shale bedrock. On some ridgetops and sloping areas the B horizon is lacking. Reaction is strongly acid to slightly acid. Depth to bedrock ranges from 20 to 40 inches.

CkD2—Crow Hill silty clay loam, 9 to 15 percent slopes, eroded. This strongly sloping soil is on hills and ridgetops. It has the profile described as representative of the series. Most areas have been cultivated. Numerous shallow rills and gullies are in evidence. Included in mapping are small areas of similar soils that are moderately alkaline throughout. Also included are small areas of Santa Lucia soils.

Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. Available water capacity is 6 to 8 inches. Depth to bedrock is 30 to 40 inches.

This soil is used for range. Some areas are mined for diatomaceous earth. Capability unit IIIe-1 (15); Loamy range site.

CkE2—Crow Hill silty clay loam, 15 to 30 percent slopes, eroded. This moderately steep soil is on hills and ridgetops. As a result of cultivation, numerous rills and shallow gullies are present in most areas. Included in mapping are small areas of Santa Lucia soils and soils similar to Crow Hill soil that are moderately alkaline throughout.

Runoff is medium to rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is moderate. Available water capacity is 4 to 8 inches. Depth to bedrock is 22 to 40 inches.

The Crow Hill soil is used for range. Some areas are mined for diatomaceous earth. Capability unit IVe-1 (15); Loamy range site.

CkF—Crow Hill silty clay loam, 30 to 50 percent slopes. This steep soil is on hills and mountains. The profile of this soil is similar to the one described as representative of the series, but depth to shale is typically 6 to 10 inches shallower.

Included in mapping are small areas of Santa Lucia and Lopez soils. Also included are small areas of soil similar to Crow Hill soil, but the profile is moderately alkaline throughout.

Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate. Available water capacity is 4 to 7.5 inches. Depth to bedrock is 20 to 36 inches.

This soil is used for range. Some areas are mined for diatomaceous earth. Capability unit VIe-1(15); Loamy range site.

CkG—Crow Hill silty clay loam, 50 to 75 percent slopes. This very steep soil is on hills and mountains. Drainageways are normally V-shaped and ridgetops are narrow. The profile of this soil is similar to the one described as representative of the series, but depth to shale is typically 6 to 14 inches shallower.

Included with this soil in mapping are small areas of Santa Lucia and Lopez soils and a soil similar to Crow Hill soil that is moderately alkaline throughout.

Runoff is very [illegible] and the hazard of water erosion is very high. The hazard of soil blowing is moderate. Available water capacity is 4 to 6 inches. Effective rooting depth is 20 to 28 inches.

This soil is used for range. Some areas are mined for diatomaceous earth. Capability unit VIIe-1(15); Loamy range site.

Diablo Series

The Diablo series consists of well drained soils on low hills within 3 miles of the coast. The soils formed in [illegible] percent. Elevation is 50 to 700 feet. Vegetation is annual grasses, forbs, and scattered oaks. Average annual precipitation is 16 to 20 inches, the mean annual air temperature is 60° to 62° F., and the frost free season is 300 to 330 days.

In a representative profile of the [illegible] mixed very dark gray and light yellowish brown clay about 13 inches thick. The subsoil is light yellowish brown mudstone to a depth of 60 inches and more. Reaction is neutral in the upper part of the surface layer and moderately alkaline below.

Permeability is slow. High shrink-swell potential is a severe limitation for urban development.

These soils are used for orchards, range, and urban development.

Representative profile of Diablo clay, 9 to 15 percent slopes, on a site under annual grasses and forbs, used for range, on Corona Del Mar Ranch, approximately ¼ mile east of ranch headquarters, about 20 feet south from Cathedral Oaks Road:

A11—0 to 30 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; strong very coarse prismatic structure parting to strong medium and coarse subangular blocky; very hard, very firm, very sticky and very plastic; common very fine roots; few very fine interstitial pores; many fine, medium, and coarse intersecting slickensides; neutral; clear wavy boundary.

A12—30 to 37 inches, [illegible] clay, black (10YR 2/1) moist; strong coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots; few very fine interstitial pores; many small and medium intersecting slickensides; very slightly effervescent with disseminated lime and violently effervescent with medium rounded lime occurring in soft masses; moderately alkaline; clear wavy boundary.

AC—37 to 50 inches; very dark gray (10YR 3/1) clay mixed with light yellowish brown (10YR 6/4) [illegible] mixed with dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; very few very fine roots; few very fine interstitial pores; few [illegible] medium intersecting slickensides; slightly effervescent with disseminated lime and violently effervescent with medium rounded lime in soft masses; moderately alkaline; gradual irregular boundary.

Cr—50 to 72 inches; light yellowish brown (10YR 6/4) marly mudstone, dark yellowish [illegible] (10YR 4/4) moist; massive, very few very fine roots; can be dug with handtools with difficulty.

The A horizon is dark gray to very dark gray that has a hue of 10YR. It has typically prismatic structure parting to medium or coarse subangular blocky, but commonly the upper ½ to 1 inch has granular structure. In most places free lime lies at a depth of 20 to 35 inches. The A horizon is 15 to 40 inches thick. Below the A horizon is a mixture of A and C material caused by soil material of the A horizon falling into deep cracks. The AC horizon has colors of the A horizon with light yellowish brown in a hue of 10YR or olive brown in a hue of 2.5Y in the C horizon. Structure is medium or strong subangular blocky. This horizon contains both disseminated and soft masses of lime. The Cr horizon is typically soft shale or mudstone, and few roots are able to penetrate. In most places, it is light yellowish brown or olive brown.

DaC—Diablo clay, 2 to 9 percent slopes. This gently sloping to moderately sloping soil is on low terrace-[illegible], Zaca, Milpitas, and Positas soils.

Runoff is medium, and the hazard of erosion is slight. Available water capacity is 6 to 11.5 inches, and effective rooting depth is 45 to 60 inches.

This soil is used for range, lemons, [illegible] urban development. Capability unit IIe-7(19,15); Clayey range site.

DaD—Diablo clay, 9 to 15 percent slopes. This rolling soil is on low hills and broad ridgetops. It has the profile described as representative of the series. Included in mapping are small areas of Arnold, Zaca, Milpitas, and Positas soils.

Runoff is medium, and the hazard of erosion is moderate. Available water capacity is about 6 to 11.5 inches. Effective rooting depth is 45 to 60 inches.

This soil is used for range, lemons, and urban development. Capability unit IIIe-5(19,15); Clayey range site.

DaE2—Diablo clay, 15 to 30 percent slopes, eroded. This moderately steep soil is on low foothills. It has a profile similar to the one described as representative of the series, but the color of the surface layer is

slightly lighter and is typically dark gray. Depth to shale or mudstone is 5 to 10 inches less because of erosion from past cultivation. Included in mapping are small areas of Zaca, Ayar, and Santa Lucia soils and areas of soils that are less than 40 inches thick over mudstone because of erosion.

Runoff is rapid, and the hazard of erosion is high. Available water capacity is 5.5 to 10.5 inches. Effective rooting depth is 40 to 55 inches.

This soil is mainly used for range. Small areas are used for lemons. Capability unit IVe-5(19,15); Clayey range site.

DaF2—Diablo clay, 30 to 50 percent slopes, eroded. This steep soil is on rolling foothills. It has a profile similar to the one described as representative of the series, but colors of the surface layer tend to be slightly lighter, usually dark gray. Depth to shale or mudstone is 5 to 15 inches less due to past cultivation and overgrazing. Included in mapping are small areas of Zaca, Ayar, and Santa Lucia soils and soils that are less than 40 inches thick over bedrock.

Runoff is rapid, and the hazard of erosion is high. Available water capacity is 5.5 to 9.5 inches. Effective rooting depth is 40 to 50 inches. This soil is used for range. Capability unit VIe-1(19,15); Clayey range site.

Dune Land

DU—Dune Land consists of hummocks, mounds, and hills of loose wind-deposited marine sand in scattered areas along the coast of the Pacific Ocean. Elevation ranges from 10 to 100 feet. Most areas are active and shifting. Within the soil are areas that are stabilized by sagebrush and dune grass. The soil material has no profile development and consists of loose sand. This land has no agricultural value but is used for recreation. Shifting dunes need to be stabilized by vegetation to prevent further movement. Capability unit VIIIe-1(19,15).

Elder Series

The Elder series consists of well drained soils on alluvial fans and in narrow valleys. The soils formed in stratified alluvium. Slope ranges from 0 to 9 percent. Elevation is 30 to 400 feet. Vegetation is annual grasses, forbs, and scattered oak trees. Average annual precipitation is 15 to 17 inches, mean annual air temperature is 60° to 62° F., and the frost free season is 310 to 330 days.

In a representative profile the surface layer is dark grayish brown sandy loam about 24 inches thick. The underlying material is stratified dark grayish brown, yellowish brown, brown, and reddish brown loamy sand, sandy loam, fine sandy loam, loam, and silty clay loam to a depth of 60 inches or more. Reaction is neutral in the surface layer and mildly alkaline and moderately alkaline in the underlying material. Free lime lies at a depth of about 38 inches.

Permeability is moderate. Available water capacity is 6 to 9 inches. Effective rooting depth is more than 60 inches.

These soils are used for orchards, field and row crops, and urban development.

Representative profile of Elder sandy loam, 0 to 2 percent slopes, on a formerly cultivated site under weedy cover, about 540 feet west of Craven Lane and 180 feet south of Carpinteria Cemetery, approximately 1.5 miles northwest of Carpinteria:

Ap1—0 to 5 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure, slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine and fine interstitial pores; neutral; abrupt smooth boundary.

Ap2—5 to 11 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard very friable slightly sticky and slightly plastic; few very fine roots; many very fine interstitial pores and common very fine tubular pores; neutral; clear smooth boundary.

A18—11 to 24 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine interstitial and tubular pores; neutral; clear wavy boundary.

C1—24 to 30 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; massive; hard, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine interstitial and tubular pores; mildly alkaline; abrupt wavy boundary.

C2—30 to 38 inches; reddish brown (5YR 4/3) coarse loamy sand with small pockets of fine gravel, dark reddish brown (5YR 3/3) moist; massive, slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial and common very fine tubular pores; mildly alkaline; abrupt wavy boundary.

C3ca—38 to 53 inches, alternate colors of reddish brown (10YR 5/3, 5/4) and brown (7.5YR 5/4) layers of loam, sandy loam, fine sandy loam, and loamy sand, dark reddish brown (5YR 3/2, 3/4) and dark brown (7.5YR 3/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic loamy sand layers and hard, friable, sticky and plastic finer layers; few very fine roots; many very fine and fine interstitial and tubular pores; strongly effervescent with disseminated lime and in fine irregular filaments and threads; moderately alkaline; abrupt smooth boundary.

C4ca—53 to 72 inches; mixed colors of dark grayish brown and brown (10YR 4/2, 5/3) and reddish brown (5YR 5/4) silty clay loam with several thin 1 to 2 inch layers of yellowish brown (10YR 5/6) loamy sand, dark brown (10YR 3/3) and dark

reddish brown (5YR 3/2, 3/4) moist, massive; hard, friable, sticky and plastic, very few very fine roots; many very fine and fine interstitial and tubular pores; strongly effervescent with disseminated lime, moderately alkaline.

The A horizon is at a depth of 21 to 28 inches. It is grayish brown and dark grayish brown and has a hue of 10YR. Typically it is sandy loam but may be fine sandy loam. The A horizon has a weak or moderate granular structure or the horizon may be massive where cultivated. Reaction is neutral or mildly alkaline.

The C horizon to a depth of more than 60 inches is highly stratified layers of sandy loam, loamy sand, loam, and silty clay loam. It is dark grayish brown, reddish brown, yellowish brown, and brown. Reaction ranges from neutral to moderately alkaline in the upper part and is moderately alkaline in the lower part. A concentration of lime in filaments and threads is at a depth of 30 to 40 inches.

Some areas have several inches of newly deposited coarse and gravelly soil material on the surface from recent floods.

Elder soils in the survey area have lime and reddish colors in the C horizon which are not defined in the range for the series. These differences, however, do not affect the use and management of the soil.

EaA—Elder sandy loam, 0 to 2 percent slopes. This nearly level soil is on alluvial fans. It has the profile described as representative of the series. Some areas are occasionally overflowed by floodwater, and deposition and channeling occurs in places.

Runoff is slow, and the hazard of erosion is slight.

This soil is used for a wide variety of crops including citrus, avocados, row crops, and flowers. Urban development and industry are encroaching in most areas. Capability unit IIs-4(19).

EaR—Elder sandy loam, 2 to 9 percent slopes. This gently sloping to moderately sloping soil is on alluvial fans in positions that occasionally overflow during heavy rainfall. It has a profile similar to the one described as representative of the series, but textures tend to be slightly coarser throughout the profile. Numerous small sandy and gravelly spots are along some stream channels. Floods cause severe damage to land and structures. Debris and stones and boulders were removed after flooding.

Runoff is medium. The hazard of erosion is moderate because of overflow.

This soil is used mainly for citrus and avocados. Small areas are used for row or vegetable crops. Urban development and industry are encroaching in some areas. Capability unit IIe-1(19).

Eb—Elder-Soboba complex, 2 to 9 percent slopes. This complex is in long narrow valleys dissected by meandering stream channels. About 30 percent of this complex is Elder sandy loams and 30 percent is such recently formed soils as Soboba stony coarse sandy loam or stony loamy sand. The remaining 40 percent is Riverwash and small areas of Metz loamy sand and Goleta fine sandy loam. The Elder soil is on remnant valley floors that are about 3 to 15 feet higher than the present channels. The Soboba and other soils and Riverwash are in the lower areas.

Elder soil has a profile similar to the one described as representative of the series. Runoff is medium, and the hazard of erosion is moderate because of overflow.

The Soboba soil has a profile similar to the one described as representative of its series. Runoff is slow, and the hazard of erosion is moderate to very high because of overflow.

This complex is used mainly for lemon and avocado orchards. Growth is uneven because of variable soil conditions. Most areas of Riverwash are not planted. Capability unit IVw-2(19).

Escarpment

ES—Escarpment consists of extremely steep breaks that extend from terraces above the coastline of the Pacific Ocean to the coastal beaches (fig. 6). They are in long narrow strips at irregular intervals from Rincon Creek on the east to the western part of the survey area. Slope ranges from 75 to more than 100 percent, and some parts are perpendicular. Difference in elevation from the beach to the top of the terrace ranges from 20 to 120 feet. Most breaks with less than a 20-foot change in elevation are noted by hatchures on the detailed soil map. In most places the base material adjacent to the beach is Monterey Shale or soft, highly fractured diatomaceous shale. Most areas are spotted by various alluvial deposits or wind-ocean deposits. Some areas are partially covered with sparse sagebrush, bunchgrass, and other brush or forbs. Large parts are devoid of vegetation.

Most of these areas are subjected to wave action during stormy periods and some areas are subjected to wave action at normal high tides. Occasionally parts of the terraces slough away causing damage to urban developments above. Uncontrolled, concentrated water runoff can cause deep gullies to form quickly in the terraces.

This land has no use except for recreation and wild-

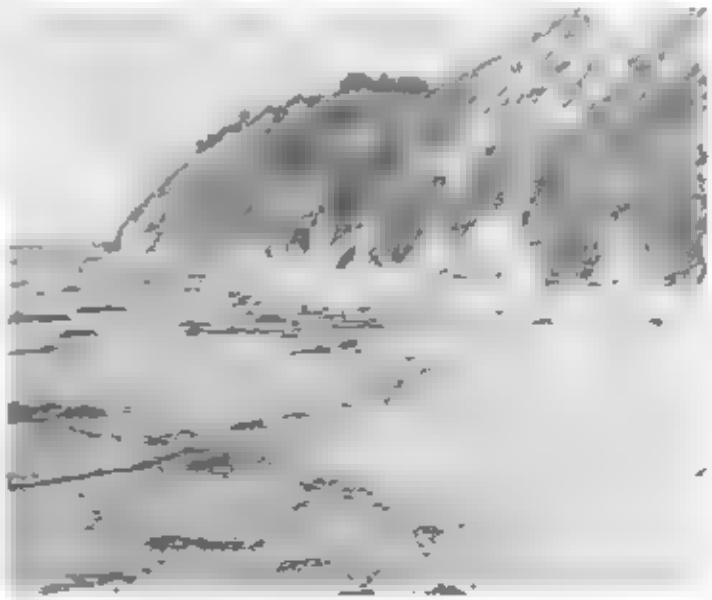

Figure 6.—Escarpment above a beach along the Pacific Ocean.

life. Stabilization to preserve the terrace edges is important in many locations. Capability unit VIIIe–1(19,15)

Gaviota Series

The Gaviota series consists of somewhat excessively drained soils on uplands. The soils formed in material weathered from hard sandstone. Slope ranges from 9 to 75 percent. Elevation is 150 to 1,500 feet. Vegetation is annual grasses, forbs, and oak trees on smoother slopes and chaparral brush on very steep slopes. Average annual precipitation is 16 to 22 inches, mean annual air temperature is 60° to 62° F., and the frost free season is 300 to 320 days.

In a representative profile the surface layer is 15 inches thick. The upper 7 inches is brown sandy loam and the lower 8 inches is brown gravelly sandy loam. The underlying material is light yellowish brown sandstone. Reaction is slightly acid. Permeability is moderate.

These soils are used for range and watershed.

Representative profile of Gaviota sandy loam, 9 to 30 percent slopes, on a site under live oaks, annual grasses, and forbs on El Capitan Ranch, approximately 14 miles west of Santa Barbara and 1.5 miles east of El Capitan State Park to Los Liagas Creek, then about 1 mile north:

A11—0 to 7 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; many very fine interstitial and tubular pores; slightly acid; clear wavy boundary.

A12—7 to 15 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine and few medium roots; many very fine interstitial pores and few fine and tubular pores; slightly acid; abrupt irregular boundary.

R—15 inches; light yellowish brown shattered sandstone; can be dug with handtools with great difficulty, hard below.

The A horizon is 10 to 20 inches thick. It is generally brown but can be grayish brown or yellowish brown. On recently burned areas a few inches of the surface may be dark brown or dark grayish brown because of darkening by charcoal. The A horizon is sandy loam or fine sandy loam with 0 to 20 percent gravel, by volume. Scattered rocks and boulders are on the surface of most areas and are more numerous on ridgetops.

GaE—Gaviota sandy loam, 9 to 30 percent slopes. This strongly sloping to moderately steep soil is in narrow bands that parallel the coast. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Arnold, Ayar, and Sespe soils. Also included are small areas that have a clay subsoil similar to Tierra soils, and loamy sand soils that are less than 20 inches thick over sandstone.

Runoff is medium, and the hazard of erosion is moderate. Available water capacity is 1.5 to 3 inches. Effective rooting depth is 14 to 20 inches.

This soil is mainly used for range. Capability unit VIe-1(19,15); Shallow Loamy range site.

GaG—Gaviota sandy loam, 30 to 75 percent slopes. This steep or very steep soil is located in narrow bands that parallel the coast. It has a profile similar to the one described as representative of the series, but depth to bedrock is typically 4 to 6 inches shallower. Typically the surface is littered with hard sandstone, stones, and boulders.

Included with this soil in mapping are areas of Ayar, Arnold, and Sespe soils. Also included are areas of loamy sand soils less than 20 inches thick over sandstone.

Runoff is rapid, and the hazard of erosion is very high. Available water capacity is 1 to 3 inches. Effective rooting depth is 10 to 20 inches.

This soil is used for range. Capability unit VIIe–1(19,15); Shallow loamy range site.

GdE—Gaviota-Rock outcrop complex, 50 to 75 percent slopes. This complex is mainly in a narrow strip paralleling the ocean. It is about 45 percent Gaviota sandy loam and 40 percent Rock outcrop and 5 percent other soils. The Gaviota soil is mainly on lower parts of south-facing slopes, ridgetops, and north-facing slopes. Rock outcrop is on long narrow exposures of resistant hard sandstone strata in the south facing slopes and is along ridgetops and steep canyon sides of north-facing slopes.

Included in this complex in mapping are areas of Maymen, San Andreas, Los Osos, and Lodo soils. Also included are large areas of soils that have slopes to 100 percent.

Gaviota soil has the profile described as representative of the series, but it is 4 to 6 inches shallower to bedrock. Runoff is very rapid, and the hazard of erosion is very high. Available water capacity is 1 to 3 inches, and effective rooting depth is 10 to 18 inches.

Rock outcrop is very steep and exposes steep mountainous areas that have exposed sandstone, shale, or conglomerate formations. Available water capacity is 0 to 1.5 inches, and effective rooting depth is 0 to 15 inches. Runoff is very rapid, and the hazard of erosion is very high.

This soil is used for watershed, limited grazing, and wildlife. Capability unit VIIs-1(19,15); Shallow Loamy Rock outcrop Complex range site.

Goleta Series

The Goleta series consists of well drained soils on flood plains and alluvial fans. The soils formed in alluvium from sedimentary rock. Slope ranges from 0 to 9 percent. Elevation is about 25 to 500 feet. Vegetation is annual grasses, forbs, and scattered oak trees. Average annual rainfall is 15 to 20 inches, mean annual air temperature is about 60° to 62° F., and the frost free season is 310 to 330 days.

In a representative profile the surface layer is dark grayish brown fine sandy loam about 13 inches thick. The underlying material is stratified grayish brown, and dark brown loamy fine sand, fine sandy loam, and loam. Reaction of the surface layer is neu-

tral. Reaction of the underlying material is mildly alkaline and moderately alkaline. The underlying material becomes calcareous at a depth of about 29 inches.

Permeability is moderate. Effective rooting depth is more than 60 inches.

Goleta soils are used for all climatically suited crops, including vegetables, row crops, field crops, and citrus (fig. 7), avocado, and walnut orchards. Nearly all areas are irrigated or are used for urban development.

Representative profile of Goleta fine sandy loam, 0 to 2 percent slopes, on a fallow site, previously used for lemons, about 2,600 feet south of Casitas Pass Road Bridge over Carpinteria Creek on farm road and 40 feet east in field, approximately 1.75 miles east of Carpinteria:

Ap1—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; hard, friable, sticky and slightly plastic; many very fine roots; many very fine interstitial pores; neutral; abrupt smooth boundary.

Ap2—5 to 13 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; very hard, firm, sticky and slightly plastic; common very fine roots; common fine interstitial pores; neutral; clear wavy boundary.

C1—13 to 29 inches; brown (10YR 5/3) fine sandy loam mixed by rodent action with dark grayish brown A horizon, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots, many very fine and fine interstitial pores, mildly alkaline, clear wavy boundary.

C2—29 to 40 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, sticky and plastic; common very fine roots; many very fine and fine interstitial pores; slightly effervescent with disseminated lime and fine irregularly shaped lime filaments near bottom of horizon; moderately alkaline; abrupt smooth boundary.

IIC3—40 to 55 inches, pale brown (10YR 6/3) loamy sand, yellowish brown (10YR 5/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; common very fine roots, many very fine interstitial pores; slightly effervescent with disseminated lime; moderately alkaline; abrupt smooth boundary.

IIIA1b—55 to 72 inches; dark brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist, massive, hard, friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial and few fine and medium tubular pores, strongly effervescent with disseminated lime and fine irregularly segregated lime in filaments or threads; numerous small

Figure 7.—Productive lemon orchard on Goleta fine sandy loam.

bits of charcoal throughout; moderately alkaline

The A horizon is 12 to 20 inches thick. It varies widely in cultivated fields because of cutting and filling for leveling. The A horizon ranges from grayish brown to dark grayish brown and has a hue of 10YR and is fine sandy loam, sandy loam, and loam. Under natural conditions, the A horizon has a weak granular or subangular blocky structure but in cultivated fields it may be structureless because of tillage. Reaction of the A horizon ranges from neutral to mildly alkaline. The C horizon is stratified and unpredictable. It contains strata of loamy sand, sandy loam, fine sandy loam, loam, and clay loam, but dominantly is fine sandy loam or loam. Colors are brown, pale brown, grayish brown, and dark grayish brown and have a hue of 10YR. Reaction is neutral to moderately alkaline. In some areas small amounts of lime are at depths of 20 to 36 inches and other areas are free of lime.

GcA—Goleta fine sandy loam, 0 to 2 percent slopes. This nearly level soil is in large valleys. It has the profile described as representative of the series.

Included with this soil in mapping near large drainageways are areas of soils that have variable texture, areas containing 10 to 15 percent gravel, and small areas of Metz and Elder soils. Lime is present in the lower profile in about 50 percent of the areas. Most areas are free of flooding, but a few are included in mapping that are occasionally flooded by overflow water from higher elevations.

Runoff is medium, and the hazard of erosion is slight. Available water capacity is 7 to 9 inches.

This soil is used for all irrigated crops suited to the area. It is also used for urban development. Capability class I(19).

GcC—Goleta fine sandy loam, 2 to 9 percent slopes. This soil is on alluvial fans adjacent to foothills and mountains. It often extends into small mountain valleys. This soil has a profile similar to the one described as representative of the series, but texture of the surface layer is more variable and stratification in the underlying material is more variable.

Included with this soil in mapping are small areas of Elder and Metz soils. Lime is in the lower part of the profile in about 50 percent of the areas. Most areas are free of flooding, but a few are included in mapping that are occasionally flooded by overflow water from higher elevations.

Runoff is medium, and the hazard of erosion is moderate. Available water capacity is 7 to 9 inches.

This soil is used for lemons, avocados, and urban development. Capability unit IIe–1(19,15).

GdA—Goleta loam, 0 to 2 percent slopes. This nearly level soil is on broad flood plains. It has a profile similar to the one described as representative of the series, but texture is slightly finer throughout the profile. The finer texture does not affect crop selection but gives the soil greater available water capacity and productivity.

Included with this soil in mapping are small areas of Elder, Agueda, and Goleta fine sandy loam. Lime is in the lower part of the profile in about 75 percent of the areas.

Runoff is medium, and the hazard of erosion is slight. Available water capacity is 8.5 to 10 inches.

This soil is used for all irrigated crops suited to the area and for urban development. Capability unit I(19).

Gullied Land

GU—Gullied Land consists of well drained areas in which the soil profile has been largely destroyed by deep gullies (fig. 8). It is in small and large valleys and on terraces, and is typically in deeply entrenched drainageways. Lateral slopes range from about 2 to 15 percent or more and side slopes generally are over 50 percent to perpendicular. Elevation ranges from near sea level to around 1,000 feet. Vegetation is oak, sycamore, and cottonwood trees, and such various brush and forbs as poison oak, berry vines, sagebrush, nettles, and hemlock. Some areas are barren.

The texture, color, and reaction of the material exposed depends on the depth of cutting and the strata exposed. The texture ranges from sand to clay.

Permeability and available water capacity are variable. In most places effective rooting depth is more than 60 inches. Runoff is very rapid and the hazard of erosion is very high. This land typically is a heavy sediment contributor which may damage land below. Maintenance of good cover on sides of the gullies is important for stability and erosion control.

This land is a haven for wildlife. Capability unit VIIIe–1(19,15).

Linne Series

The Linne series consists of well drained soils on uplands. The soils formed in material weathered from calcareous shale or mudstone. Slope ranges from 15 to 75 percent. Elevation is 100 to 1,000 feet. Vegetation is annual grasses and forbs. Average annual precipitation is 16 to 20 inches, mean annual air temperature is 60° to 61° F., and the frost free season is 310 to 330 days.

In a representative profile the surface layer is very dark gray clay loam about 29 inches thick. The underlying material to a depth of 48 inches is dark grayish brown clay loam. Below this is very pale brown soft marly mudstone. Reaction is moderately alkaline and strongly calcareous throughout. Permeability is moderately slow.

These soils are used for range.

Representative profile of Linne clay loam, 15 to 30 percent slopes, on a site under annual grasses and forbs used for range on Hollister Ranch, about 0.7 mile north and 0.5 mile west from intersection of Rancho Real Road and San Augustine Road:

A11—0 to 14 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to moderate medium granular; slightly hard, very friable sticky and plastic; many very fine and few fine roots; many very fine and fine interstitial pores; strongly effervescent with disseminated lime; moderately alkaline; 1 to 5 percent, by volume, gravel; numerous krotovinas 2 to 4 inches in diameter; clear wavy boundary.

A12—14 to 29 inches; very dark gray (10YR

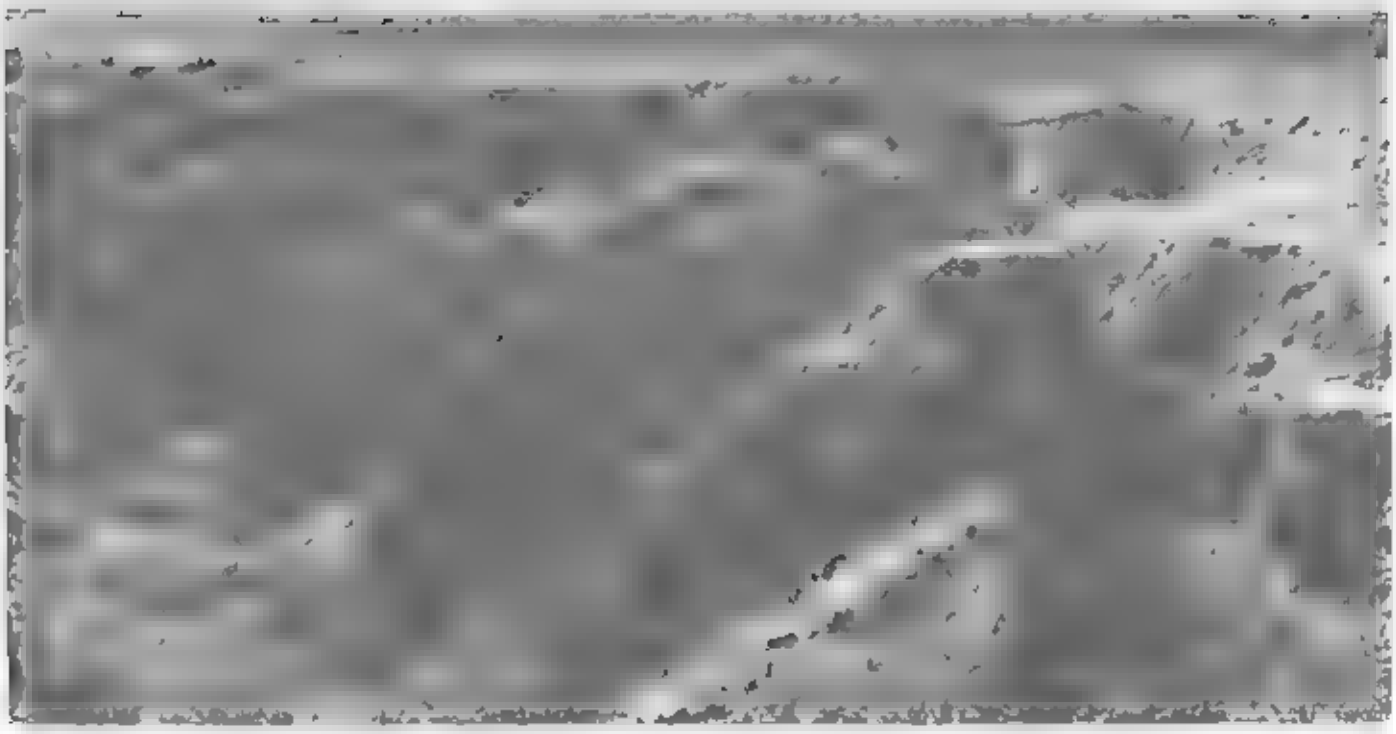

Figure 8.—Gullied land in an area of Concepcion soil. The gulies formed after the soil had been intensively cultivated.

3/1) clay loam, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to moderate fine granular; slightly hard, very friable, sticky and plastic; common very fine roots, many very fine and fine interstitial pores and few very fine and fine tubular pores, violently effervescent with disseminated lime and lime filaments and threads in lower part; moderately alkaline; 1 to 5 percent by volume gravel; numerous krotovinas 2 to 4 inches in diameter, clear wavy boundary

C1ca—29 to 43 inches; dark grayish brown (10YR 4/2) clay loam, very dark gray (10YR 3/1) moist; weak fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; very few very fine roots; common very fine and fine interstitial and tubular pores; violently effervescent with lime in filaments and threads; moderately alkaline; 1 to 5 percent, by volume, gravel; numerous krotovinas 2 to 4 inches in diameter, clear wavy boundary

C2ca—43 to 48 inches; pale brown (10YR 6/3) clay loam, dark grayish brown (10YR 4/2) moist, massive; hard, very sticky and plastic; very few very fine roots; few very fine and fine interstitial and common very fine tubular pores; violently effervescent with lime in filaments and threads; moderately alkaline; 5 to 10 percent, by volume, gravel; clear wavy boundary

Cr3—48 inches; very pale brown (10YR 7/3) calcareous mudstone, pale brown (10YR 6/3) moist; can be dug with handtools with great difficulty

The profile is calcareous throughout. In some pedons, however, the uppermost few inches do not effervesce. Some areas have 1 to 5 percent of the surface littered with hard limestone cobbles and pebbles.

The A horizon is gray, dark gray, or very dark gray and has a hue of 10YR and a chroma of 1. It is clay loam or silty clay loam that is 20 to 35 inches thick. The lower part of the A horizon contains few to many lime filaments.

The lower part of the profile has some combination of an ACca or Cca horizon. Typically lime is present as distinct filaments and threads, but soft masses and concretions are common. Some pedons contain up to 20 percent, by volume, cobbles and gravels in the lower part. Depth to shale or mudstone ranges from about 26 to 50 inches.

Some Linne soils in the survey area are more than 40 inches thick over shale and mudstone, which is greater than defined in the range for the series. This difference, however, does not greatly affect the use and management of these soils.

LaE—Linne clay loam, 15 to 30 percent slopes. This moderately steep soil is in narrow bands that parallel

the coastline of the Pacific Ocean within a mile of the ocean. It has the profile described as representative of the series. Included with this soil in mapping are small areas of Nacimiento and Zaca soils and areas of soils that have slopes of 9 to 15 percent.

Runoff is medium, and the hazard of erosion is moderate. Available water capacity is 7 to 10 inches. Effective rooting depth is 40 to 50 inches.

This soil is used for range. Capability unit IVe-1 (19,15); Clayey range site.

LaF2—Linne clay loam, 30 to 50 percent slopes, eroded. This steep soil is in narrow bands that parallel the coastline of the Pacific Ocean within a mile of the ocean. It has a profile similar to the one described as representative of the series, but it is 4 to 8 inches shallower to bedrock. About 15 percent of this soil is on ridgetops that have soil less than 40 inches to bedrock. Most areas have been overgrazed, and moderate sheet erosion has occurred. A few landslides occur in this soil. Included in mapping are small areas of Nacimiento, Zaca, and Santa Lucia soils.

Runoff is rapid, and the hazard of erosion is high. Available water capacity is 7 to 10 inches. Effective rooting depth is 40 to 50 inches.

This soil is used for range. Capability unit VIe-1 (19,15); Clayey range site.

LnG—Linne clay loam, 50 to 75 percent slopes. This very steep soil is on slopes in narrow bands that parallel the coastline of the Pacific Ocean within a mile of the ocean. It has a profile similar to the one described as representative of the series, but it is 6 to 14 inches shallower to bedrock. A few landslides are in this soil. Included in mapping are small areas of Nacimiento, Zaca, Santa Lucia, and Lopez soils.

Runoff is very rapid, and the hazard of erosion is very high. Available water capacity is 4.5 to 8 inches. Effective rooting depth is 26 to 40 inches.

This soil is used for range. Capability unit VIIe-1 (19,15); Clayey range site.

Lodo Series

The Lodo series consists of somewhat excessively drained soils on foothills of the Santa Ynez Mountains. The soils formed in material weathered from sandstone or shale bedrock. Slope ranges from 30 to 75 percent. Elevation is 300 to 2,000 feet. Typically vegetation is chaparral-type brush consisting mainly of ceanothus and laurel. Average annual rainfall is 17 to 22 inches, mean annual air temperature is 59° to 61° F., and the frost free season is 280 to 300 days.

In a representative profile the surface layer is brown gravelly clay loam about 11 inches thick over sandstone bedrock. Reaction is mildly alkaline. Seams of lime are present in the bedrock.

Permeability is moderate. Available water capacity is 1 to 3 inches. Effective rooting depth is 6 to 20 inches.

These soils are used for watershed, limited range, and avocados.

In the survey area Lodo soils are mapped only as a complex with Sespe soils or with Rock outcrop.

Representative profile of Lodo gravelly clay loam in an area of Lodo-Rock outcrop complex, 50 to 75 percent slopes, on a site under chaparral brush on Mountain Drive road edge, 0.6 mile east of Gibraltar Road and Mountain Drive intersection:

A11—0 to 2 inches dark brown (7.5YR 4/2) gravelly clay loam, very dark brown (7.5YR 2/2) moist; strong fine granular structure; hard, friable, sticky and plastic; many very fine roots; few very fine tubular and many very fine interstitial pores; mildly alkaline; clear wavy boundary. (Area recently burned; may account for darker surface 2 inches.)

A12—2 to 11 inches, brown (7.5YR 5/4) gravelly clay loam, dark brown (7.5YR 3/2) moist; moderate medium granular structure; hard, friable, sticky and plastic; many very fine and fine roots; many very fine and fine interstitial pores and common fine tubular pores; mildly alkaline; abrupt irregular boundary.

R—11 inches; deeply shattered medium grained sandstone bedrock. Some lime in seams and cracks of bedrock.

The A horizon is brown or dark brown and has a hue of 7.5YR. It is clay loam or gravelly clay loam. The upper part of the A horizon is often darkened by charcoal from periodic burns. Depth to bedrock ranges from about 6 to 20 inches and typically is about 12 inches. Bedrock is reddish colored sandstone but may include local areas of bedded shale and conglomerate. Reaction is moderately to mildly alkaline.

LoG—Lodo-Rock outcrop complex, 50 to 75 percent slopes. This complex consists of about 60 percent Lodo soils and 30 percent Rock outcrop. Lodo soils are located mainly on lower side slopes. Rock outcrop occupies long narrow exposures of resistant tilted rock strata and on ridgetops.

Included with this complex in mapping are about 8 percent Sespe soil and 2 percent Maymen soil. Also included is a small area north of Santa Barbara in the vicinity of Painted Cave that is 2 to 8 degrees colder than the temperature range defined for the Lodo series.

Lodo soil in this mapping unit has the profile described as representative of the Lodo series. Runoff is very rapid, and the hazard of erosion is very high.

Rock outcrop is very steep and extremely steep mountainous areas that have exposed sandstone, shale, or conglomerate formations. Available water capacity is 0 to 1.5 inches, and effective rooting depth is 0 to 15 inches. Runoff is very rapid, and the hazard of erosion is very high.

This complex is used for watershed and wildlife. Capability unit VIIs-1 (19,20); Shallow Loamy-Rock outcrop Complex range site.

LsG—Lodo-Sespe complex, 50 to 75 percent slopes. This complex consists of about 60 percent Lodo soil and 30 percent Sespe soil. Lodo soil is on high side slopes and ridgetops and Sespe soil is on low side slopes. Included in mapping are about 3 percent Rock outcrop and about 7 percent Ayar, Gaviota, and Maymen soils.

Lodo soil has a profile similar to the one described as representative of the series. Runoff is very rapid, and the hazard of erosion is very high.

Sespe soil has the profile described as representative

of the series. Runoff is very rapid, and the hazard of erosion is very high.

This complex is typically covered with chaparral brush. It is used for watershed and limited range, and small areas are used for [illegible]. Capability unit VIIe–1 (19, 20); Lodo soil is in Shallow Loamy range site, Sespe soil is in Clayey range site.

Lopez Series

The Lopez series consists of somewhat excessively drained soils on uplands. The soils formed in tilted and folded siliceous shale bedrock on the Monterey Formation. Slope ranges from 9 to 100 percent. Elevation is [illegible] feet. Vegetation is [illegible] oak trees, and sparse annual grasses and forbs. Average annual precipitation is 16 to 20 inches, mean annual air temperature is 60° to 62° F., and the frost free season is 310 to 330 days.

In a representative profile the surface layer is dark gray [illegible] shaly clay loam about 16 inches thick over highly fractured siliceous shale. Reaction is medium acid.

Permeability is moderate.

These soils are used for watershed and very limited range.

Representative profile of Lopez shaly clay loam in an area of Lopez-Santa Lucia complex, 9 to 30 percent slopes, [illegible] under [illegible] and annual grasses and forbs; [illegible] feet west of Santa Anita Ranch Headquarters on the Hollister Ranch:

A11—0 to 6 inches, dark gray (10YR 4/1) shaly clay loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; slightly hard, very friable, sticky and plastic; many roots of all sizes; [illegible] 35 percent, by volume, coarse shale fragments that have about 90 percent under 3 inches in diameter; medium acid; gradual irregular boundary.

A12—6 to 16 inches, dark gray (10YR 4/1) very shaly clay loam, very dark brown (10YR 2/2) moist; [illegible] structure; slightly hard, very friable, sticky and plastic; many roots of all sizes; [illegible] 50 percent, by volume, coarse shale fragments that have about 90 percent under 3 inches in diameter; medium acid; abrupt irregular boundary.

R—16 inches; hard highly fractured Monterey Shale. Bedding planes at about 10 to 20 degree angle. Rock color is light gray and fragments may be coated with thin brown clay films.

The A horizon in most places is dark gray, but may be gray in open exposed areas or very dark gray under [illegible]. Colors are in 10YR hue. Depth to bedrock ranges from 4 to 20 inches. Coarse fragment content typically increases with depth. Coarse fragments in the top 4 to 8 inches range from 20 to 50 percent, by volume, with 10 to 20 percent of the coarse fragments over 3 inches in diameter. The rest of the soil contains 35 to 50 percent coarse fragments, by volume, with 10 to 20 percent of the coarse fragments over 3 inches in diameter. Shale fragments are seldom more than 6 inches across and are typically less than 3 inches thick. All fragments are flaggy and brittle.

LdG—Lopez-Rock outcrop complex, 50 to 75 percent slopes. This very steep complex is on mountainous uplands. It consists of about 70 percent Lopez shaly clay loam and 25 percent Rock outcrop. Lopez occupies smoother less [illegible] parts of the complex and Rock outcrop consists of bands of hard, weather-resistant Monterey Shale that was exposed by tilting. Most of the remaining 5 percent of the complex is small areas of Santa Lucia, Linne, and Capitan soils. On the western edge of the survey area, there is a small area consisting of more than 60 percent rhyolite rock outcrop. Intermingled with the rock outcrop is a soil that is brown stony loam formed from rhyolite bedrock. Depth to bedrock is 6 to 18 inches, and reaction is strongly acid or medium acid.

Lopez soil has the profile described as representative of the series, but it averages 2 to 6 inches shallower to bedrock. Runoff is very rapid, and the hazard of erosion is very high. Available water capacity is about 0.5 to 2 inches. Effective rooting depth is 6 to 18 inches.

Rock outcrop is very steep and extremely steep mountainous areas that have exposed sandstone, shale, [illegible] formations. Available water capacity is [illegible] inches. Effective rooting depth is 0 to 15 inches. Runoff is very rapid, and the hazard of erosion is very high.

This complex is used for limited range and for watershed. Capability unit VIIs–1 (19, 15); Shallow Loamy-Rock outcrop Complex range site.

LdH—Lopez-Rock outcrop complex, 75 to 100 percent slopes. This very steep complex is located in mountainous uplands within 1 mile of the coast. It consists of about 60 percent Lopez shaly clay loam and 35 percent Rock outcrop. Lopez occupies smoother areas of the complex and Rock outcrop consists of lands of hard, weather-resistant Monterey Shale that was exposed by tilting. Included in mapping are about 5 percent Santa Lucia, Capitan, and Linne soils.

Lopez soil has the profile described as representative of the series, but it averages 4 to 8 inches shallower to bedrock. Runoff is very rapid, and the hazard of erosion is very high. Available water capacity is about 0.5 to 1.5 inches. Effective rooting depth is 4 to 15 inches.

Rock outcrop is very steep and extremely steep mountainous areas that have exposed sandstone, shale, or conglomerate formations. Available water capacity is 0 to 1.5 inches, and effective rooting depth is 0 to 15 inches. Runoff is very rapid, and the hazard of erosion is very high.

This complex is used for watershed and very limited [illegible] (Capability unit VIIs–1 (19, 15).

LeF2—Lopez-Santa Lucia complex, 9 to 30 percent slopes, eroded. This complex is [illegible] the coastline of the Pacific Ocean within 0.5 mile of the ocean. It consists of about 50 percent Lopez shaly clay loam and 40 percent Santa

Lucia shaly clay loam. Lopez soil is located mostly on convex ridgetops and Santa Lucia soil is located on lower side slopes and depressions where the bedrock is more deeply weathered. Most areas have uneven surfaces due to rills and shallow gullies caused by past erosion from cultivation. Included in mapping are 10 percent Concepcion and Linne soils.

The Lopez soil has the profile described as representative of the series. Runoff is rapid, and the hazard of erosion is high. Available water capacity is 0.5 to 2 inches. Effective rooting depth is 6 to 20 inches.

The Santa Lucia soil has a profile similar to the one described for that series. Runoff is medium to rapid, and the hazard of erosion is high. Available water capacity is 2.5 to 4 inches. Effective rooting depth is 24 to 30 inches.

This complex is used for range and occasional grain or hay production. Capability unit VIIe-1(19,15); Lopez soil is in Shallow Loamy range site, Santa Lucia soil is in Loamy range site.

LcF2—Lopez-Santa Lucia complex, 30 to 50 percent slopes, eroded. This complex is on foothills within 15 mile of the coastline of the Pacific Ocean. It is in irregular bands that parallel the coastline. It consists of about 60 percent Lopez shaly clay loam and 30 percent Santa Lucia shaly clay loam. Lopez soil is located on concave ridgetops and steep side slopes. Santa Lucia soil is located on convex areas and near the toe slopes of the hills. Numerous rills and shallow gullies are a result of erosion from past cultivation.

Included with this complex in mapping are about 10 percent Linne and Concepcion soils. Also included on the western edge of the survey is a soil that has the similar use and management to soils in this complex. This soil is a brown very stony loam that formed on hard rhyolitic rock. It is strongly acid or medium acid and about 10 to 18 inches deep to bedrock.

The Lopez and Santa Lucia soils have a profile similar to the one described as representative of their respective series except they both average 2 to 4 inches shallower to bedrock.

Lopez soil has rapid runoff and a high hazard of erosion. Available water capacity is 0.5 to 2 inches, and the effective rooting depth is 4 to 18 inches.

Santa Lucia soil has rapid runoff and a high hazard of erosion. Available water capacity is 2 to 3.5 inches, and the effective rooting depth is 22 to 26 inches.

This complex is used for range. Capability unit VIIe-1(19,15); Lopez soil is in Shallow Loamy range site, Santa Lucia soil is in Loamy range site.

Los Osos Series

The Los Osos series consists of well drained soils on uplands. The soils formed in material weathered from soft shale. Slope ranges from 15 to 75 percent. Elevation is 200 to 1,900 feet. Vegetation is mostly annual grasses and forbs and some sagebrush and oak trees. Average annual precipitation is 16 to 24 inches, mean annual air temperature is 60° to 62° F., and the frost free season is 300 to 330 days.

In a representative profile the surface layer is brown clay loam about 10 inches thick. The subsoil is brown and light brownish gray clay about 20 inches thick. The substratum is olive gray clay loam about 4 inches thick that rests on light olive gray highly fractured soft shale. Reaction is medium acid to neutral. Permeability is slow.

These soils are used for range.

Representative profile of Los Osos clay loam, 30 to 50 percent slopes, eroded, on a site under annual grasses, forbs, and scattered sagebrush, on Hollister Ranch, about 1.5 miles north of San Augustine Beach, about 400 feet west of Pescadero Creek on road cut.

A1—0 to 10 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; many very fine roots; common very fine tubular pores and common very fine and fine interstitial pores; medium acid; abrupt wavy boundary.

B21t—10 to 28 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; strong coarse prismatic structure; very hard, friable, very sticky and very plastic; common very fine and very few fine and medium roots; few very fine tubular pores and few very fine interstitial pores; many moderately thick clay films on ped faces and in pores; slightly acid; clear wavy boundary.

B22t—28 to 30 inches; light brownish gray (2.5Y 6/2) light olive gray (5Y 6/2) dry; dark grayish brown (2.5Y 4/2) moist; strong very coarse prismatic structure; hard, friable, sticky and plastic; few fine and very fine roots; few very fine tubular pores and common very fine interstitial pores; neutral; clear wavy boundary.

C1—30 to 31 inches; olive gray (5Y 5/2) clay loam, olive gray (5Y 4/2) moist; massive; hard, friable, sticky and plastic; very few very fine and fine roots; few very fine tubular pores and common very fine interstitial pores; very few thin clay films in pores; about 50 percent of the matrix is soft shale fragments that soften on wetting; neutral; abrupt wavy boundary.

C2r—31 to 60 inches; highly fractured light olive gray (5Y 6/2) soft shale.

The A horizon is grayish brown, brown, or dark grayish brown that has a hue of 10YR. It is typically clay loam and is commonly loam. The A horizon has weak or moderate fine or medium subangular blocky structure. Reaction is medium acid to neutral. Depth to the B horizon ranges from 8 to 15 inches.

The B horizon is brown, grayish brown, olive brown, or light brownish gray. It is clay in the upper part and light clay or clay loam in the lower part. The B horizon has weak to strong prismatic or subangular blocky structure. Reaction is medium acid to neutral. Depth to soft shale ranges from about 20 inches on ridgetops to 40 inches on toe slopes.

LgE2—Los Osos clay loam, 15 to 30 percent slopes, eroded. This moderately steep soil is in small irregular areas within larger areas of steeper Los Osos soils. Most areas are in bands that parallel the coastline of the Pacific Ocean. This soil has a profile similar to the

one described as representative of the series, but it is 4 to 6 inches deeper to bedrock. Some gullies 3 to 6 feet deep have opened as a result of overgrazing. Landslides make up less than 5 percent of the area.

Included with this soil in mapping are areas of Maymen and Gaviota soils and narrow ribs of hard rock outcrops. Also included are some lower slopes that have soils similar to Los Osos but are 40 to 50 inches deep to bedrock.

Runoff is medium, and the hazard of erosion is moderate. Available water capacity is 4.5 to 7 inches. Effective rooting depth is 30 to 40 inches.

This soil is used for range. Capability unit IVe-3(15); Clayey range site.

LgF2—Los Osos clay loam, 30 to 50 percent slopes, eroded. This steep soil is in narrow, long bands that parallel the coastline of the Pacific Ocean. It has the profile described as representative of the series. Gullies 2 to 6 feet deep have formed in many drainageways. Landslides occupy 5 to 10 percent of the area. Included in mapping are small areas of Maymen and Gaviota soils.

Runoff is rapid, and the hazard of erosion is high. Available water capacity is 4 to 7 inches. Effective rooting depth is 25 to 40 inches.

This soil is used for range. Capability unit VIe-1(19,15); Clayey range site.

LhG—Los Osos-Maymen complex, 50 to 75 percent slopes. This complex is in the western part of the survey area in long narrow strips that parallel the coastline of the Pacific Ocean at distances of 2 to 4 miles. It consists of about 40 percent Los Osos clay loam, 30 percent Maymen fine sandy loam, 20 percent Gaviota soils and Rock outcrops, and 10 percent landslides.

The parent rock in this complex is sedimentary rock strata tilted at an angle of 45 to 60 degrees. Many different types of rock are exposed because of tilting. Los Osos soil formed from deep weathering of soft shale. Maymen and other shallow soils formed in material weathered from sandstone and shale. Some harder sandstone areas are Rock outcrop and are nearly devoid of soil material.

Los Osos soil has the profile described as representative of the series, but it averages 4 to 12 inches shallower to bedrock. Runoff is very rapid, and the hazard of erosion is very high. Available water capacity is 3 to 6 inches. Effective rooting depth is 20 to 35 inches.

Maymen soil has a profile similar to the one described as representative of the series. Runoff is very rapid, and the hazard of erosion is very high. Available water capacity is 1 to 2 inches. Effective rooting depth is 8 to 18 inches.

This complex is used for range and watershed. Capability unit VIIe-1(15). Los Osos soil is in Clayey range site, Maymen soil is in Shallow Loamy range site.

Maymen Series

The Maymen series consists of well drained soils on mountains of the Santa Ynez Range. The soils formed in material weathered from sandstone, conglomerate, and shale bedrock. Slope ranges from about 15 to 100 percent. Elevation is 1,000 to 4,700 feet. Vegetation is chaparral-type brush which includes chamise, ceanothus, sumac, deervetch and many others. Average annual precipitation is 20 to 28 inches, mean annual air temperature is 57° to 59° F., and the frost free season is 250 to 300 days.

In a representative profile the surface layer is brown stony fine sandy loam about 4 inches thick. The subsoil is light brown loam about 10 inches thick which rests on fractured yellowish brown medium and coarse-grained sandstone bedrock. Reaction is strongly acid throughout. Permeability is moderate.

These soils are used for watershed, limited range, wildlife habitat, and recreation.

Representative profile of Maymen stony fine sandy loam, 30 to 75 percent slopes, on a site under chaparral cover used for watershed in the City of Santa Barbara, in Mission Canyon, approximately ¾ mile east of the South Portal of the Santa Barbara Tunnel:

A1—0 to 4 inches; brown (7.5YR 5/2) stony fine sandy loam, dark brown (7.5YR 3/2) moist; weak medium granular structure; slightly hard, very friable, nonsticky and slightly plastic; many very fine, fine and very few coarse roots; many very fine interstitial pores and common very fine and fine tubular pores; about 10 percent of the soil is rounded hard sandstone cobbles, stones, and boulders in horizon, 3 percent on surface; strongly acid; clear wavy boundary.

B2—4 to 14 inches; light brown (7.5YR 6/4) light loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine, common fine and medium roots; many very fine interstitial pores and many very fine, fine, and medium tubular pores; about 10 percent of the soil is rounded hard sandstone cobbles, stones, and boulders; strongly acid; diffuse broken boundary.

R—14 inches; fractured, yellowish brown, light yellowish brown, and reddish brown coarse and medium-grained hard sandstone.

The A horizon is light brown and brown that has a hue of 7.5YR or 10YR. In many areas the upper 1 inch to 3 inches is darkened by charcoal from recent burns, and is very dark brown or very dark grayish brown. Depth to bedrock ranges from 6 to 20 inches. Typically, coarse fragments of gravel, cobbles, stones, and boulders up to 10 or more feet in diameter make up 10 to 35 percent of the soil, but some areas on lesser slopes contain only 5 to 10 percent of coarse fragments. Texture includes sandy loam, fine sandy loam, and light loam. Structure is weak or moderate granular, but may be lacking. Reaction is medium acid to strongly acid.

The B horizon is light brown and has a hue of 7.5YR, but may be light yellowish brown that has a hue of 10YR. It is fine sandy loam or loam. Gravel, cobbles, stones, and boulders make up 5 to 35 percent, by volume, of the horizon. The B horizon has a weak

and moderate granular or subangular blocky structure. Reaction is medium acid to strongly acid.

The underlying bedrock in most places is coarse-grained to medium-grained, hard, highly fractured sandstone to a depth of many feet. Conglomerate and shale bedrock are in some areas.

MaE—Maymen stony fine sandy loam, 15 to 30 percent slopes. This moderately steep soil is in small irregularly shaped areas typically surrounded by larger bodies of steep Maymen soils and Maymen-Rock outcrop complex. It has a profile similar to the one described as representative of the series, but depth to bedrock is 4 to 6 inches or more. Included in mapping are small areas of Rock outcrop and Gaviota soils and areas that have soils more than 20 inches to bedrock.

Runoff is medium, and the hazard of erosion is moderate. Available water capacity is 1 to 2.5 inches. Effective rooting depth is 12 to 20 inches.

This soil is used for wildlife range and urban development. Capability unit VIIe–1(20); Shallow Loamy range site.

MaG—Maymen stony fine sandy loam, 30 to 75 percent slopes. This steep or very steep soil is in small, scattered areas adjacent to or surrounded by large areas of Maymen-Rock outcrop complex. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Sespe, Lodo, and Gaviota soils and Rock outcrop. Also included are areas of soils that are deeper than 20 inches to bedrock and other small areas of soils that are 10 to 20 inches deep that formed in material weathered from soft fractured shale.

This soil has more open grass and oak-covered areas than the Maymen soil mapped in complex with Rock outcrop and has greater value as range or woodland.

Runoff is very rapid, and the hazard of erosion is very high. Available water capacity is 1 to 2 inches. Effective rooting depth is 10 to 18 inches.

This soil is used for watershed, wildlife, and range. Capability unit VIIe–1(20); Shallow Loamy range site.

MhH—Maymen-Rock outcrop complex, 50 to 100 percent slopes. This very steep to extremely steep complex is on the rugged parts of the Santa Ynez Range. It consists of about 45 percent Maymen soil, 40 percent Rock outcrop; 5 percent Lodo and Gaviota soils and small scattered areas that have soils 6 to 15 inches deep on soft fractured shale; and 10 percent soils similar to Maymen but that have a depth to bedrock of less than 10 inches. Maymen soil is in some of the smoother, less sloping areas, and Rock outcrop occurs mainly as long extremely steep exposures of resistant, tilted rock strata. Some Rock outcrop areas are almost solid exposures of both attached and detached rocks.

Maymen soil has a profile similar to the one described as representative of the series. Runoff is very rapid and the hazard of erosion is very high. Available water capacity is 1 to 2 inches. Effective rooting depth is 10 to 18 inches.

Rock outcrop is very steep and extremely steep mountainous areas that have exposed sandstone, shale, or conglomerate formations. Available water capacity is 0 to 1.5 inches, and effective rooting depth is 0 to 15 inches. Runoff is very rapid, and the hazard of erosion is very high.

This complex is used for watershed, wildlife habitat, and recreation. Capability unit VIIIs–1(20,15).

Metz Series

The Metz series consists of somewhat excessively drained soils on recently deposited alluvial fans. The soils formed in coarse textured calcareous alluvium. Slope ranges from 0 to 2 percent. Elevation is 10 to 100 feet. Vegetation is sycamore trees, poison oak, annual grasses, and forbs. Average annual precipitation is 16 to 20 inches, mean annual air temperature is 60°F., and the frost free season is 300 to 330 days.

In a representative profile the soil is pale brown and very pale brown stratified loamy sand and coarse sandy loam 58 inches thick. Below this is buried dark grayish brown fine sandy loam that extends to a depth of more than 60 inches. The soil is moderately alkaline and calcareous throughout.

Permeability is moderately rapid. Available water capacity is 4 to 6 inches. Effective rooting depth is over 60 inches.

These soils are used for lemons and avocados, or they are idle.

Representative profile of the Metz series on a site under sycamore, poison oak, annual grasses, and weeds, approximately 2,500 feet northeast of U.S. Highway 101, approximately 4,900 feet east of the intersection of Linden Avenue and Carpinteria Avenue.

C1—0 to 16 inches; pale brown (10YR 6/3) loamy sand, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; many roots of all sizes; many very fine interstitial pores; slightly effervescent with disseminated lime; moderately alkaline; abrupt wavy boundary.

C2—16 to 21 inches; pale brown (10YR 6/3) coarse sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common roots of all sizes; many very fine interstitial pores and few very fine tubular pores; strongly effervescent with disseminated lime; moderately alkaline; abrupt wavy boundary.

C3—21 to 58 inches, very pale brown (10YR 7/3) loamy sand; brown (10YR 4/3) moist, massive; soft, very friable, nonsticky and nonplastic; many coarse and common fine and medium roots; many very fine interstitial pores; very slightly effervescent with disseminated lime; moderately alkaline; abrupt wavy boundary.

IIA1b—58 to 66 inches, dark grayish brown (10YR 4/2) fine sandy loam, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine medium and coarse roots; many very fine interstitial pores; violently effervescent with disseminated lime; moderately alkaline.

The C1 horizon is pale brown, grayish brown, brown, and light brownish gray that has a hue of 10YR. It is loamy sand or loamy fine sand. The lower part of the C horizon varies in color and texture depending on the local stratification. Color includes values of 4, 5, 6, and 7, and chroma of 2 or 3 in a hue of 10YR. Stratified texture includes loamy sand, sand, coarse sandy loam, fine sandy loam, and sandy loam, but typically is loamy sand. Lime in disseminated form is throughout the profile. A buried Ab horizon is in many areas. It is typically deeper than 50 inches.

Mc—Metz loamy sand. This nearly level soil is in [illegible] areas adjacent to major stream channels. Included in mapping are small areas of Riverwash, Elder, and Soboba soils.

Runoff is slow, and the hazard of erosion is moderate. Occasional overflow during heavy rainfall can cause scouring and channeling.

This soil is used for lemons and avocados, or it is idle. Capability unit IIIw–4 (19)

Milpitas Series

The Milpitas series consists of moderately well drained soils on terraces. The soils formed in mixed alluvial deposits. Slope ranges from 2 to 50 percent. Elevation is 80 to 800 feet. Vegetation is annual grasses and forbs, sagebrush, and scattered oak trees. Average annual precipitation is 14 to 19 inches, mean annual air temperature is 60° to 61° F., and the frost free season is 300 to 330 days.

In a representative profile, the surface layer is brown and light brownish gray fine sandy loam and loam about [illegible] inches thick. The subsoil over is light gray loam about 1 inch thick. The upper 17 inches of the subsoil is dark yellowish brown clay and the lower 12 inches is brown heavy sandy clay loam. The substratum is yellowish brown very gravelly sandy loam. Reaction is typically medium acid in the surface layer and slightly acid to mildly alkaline in the subsoil. Permeability is very slow.

This soil is used for range, urban development, lemons, and avocados.

Representative profile of Milpitas fine sandy loam in an area of Milpitas-Positas fine sandy loams, 2 to 9 percent slopes, on an unused site under annual grasses and forbs, near Elwood, west of Goleta, between U.S. Highway 101 and railroad right of way, 250 feet southeast of intersection of Winchester Canyon Road and U.S. Highway 101:

A11—0 to 8 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; 0 to 2 inches weak medium granular structure, 2 to 8 inches weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial pores and common very fine and medium tubular pores; medium acid; clear smooth boundary.

A12—8 to 20 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist, massive, hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine interstitial pores and many very fine and medium tubular pores and common fine tubular pores; medium acid; gradual smooth boundary.

A13—20 to 24 inches, light brownish gray (10YR 6/2) loam, dark brown (10YR 3/3) moist with ¼ of area small diffuse light gray (10YR 7/2) blotches; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic, common very fine roots; many very fine interstitial pores and many very fine and medium tubular pores; medium acid; clear wavy boundary.

A2—24 to 25 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; weak medium platy structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine interstitial pores and common very fine and few fine tubular pores; medium acid; common ⅛ to ¼ inch lumps of dark brown clay; abrupt wavy boundary.

B21t—25 to 33 inches; dark yellowish brown (10YR 3/4) clay, dark yellowish brown (10YR 3/4) moist, moderate coarse prismatic structure parting to weak coarse angular blocky; extremely hard, firm, very sticky and very plastic; common very fine exped roots; common very fine and few medium tubular pores; common moderately thick clay films on peds and in tubular pores; slightly acid; tops of prisms flat with A2 horizon penetrating [illegible] to [illegible] inch, gradual smooth boundary.

B22t—33 to 42 inches; yellowish brown (10YR [illegible]) sandy clay, dark yellowish brown (10YR 4/4) moist; weak coarse prismatic structure parting to moderate coarse angular blocky; extremely hard, firm, very sticky and very plastic; few very fine exped roots; common very fine tubular pores; continuous moderately thick clay films as bridges and in tubular pores and common peds; mildly alkaline; gradual smooth boundary.

B3t—42 [illegible] inches, brown (7.5YR 5/4) heavy fine sandy clay loam, dark brown (7.5YR 4/4) moist; moderate coarse angular blocky structure; very hard, firm, sticky and plastic; common very fine exped roots; common very fine tubular pores; continuous thin clay films as bridges and common moderately thick films on peds; mildly alkaline; gradual smooth boundary.

IIC—54 to 68 inches; yellowish brown (10YR 5/4) very gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; massive, hard, firm, sticky and slightly plastic; common very fine interstitial and few fine tubular pores; continuous thin clay films in bridges that have common thick very dark brown (10YR 2/2) films

in horizontal streaks, 60 percent gravel; neutral.

The A horizon, in most places, is brown under cultivation and dark brown in some undisturbed areas, and has hues of 10YR or 7.5YR. The lower part of the A horizon may be light brownish gray or grayish brown. Texture is typically fine sandy loam, but may be very fine sandy loam or loam. In some areas near the coast, sandy wind-blown deposits thicken the surface layer and give it a texture of loamy sand or coarse sandy loam. In most places the A horizon is massive and hard, or has weak granular or weak subangular blocky structure, except where it has been mixed with wind-blown material. In these areas the A horizon is massive and slightly hard. Reaction in the A [illegible]

The A2 horizon ranges from 1 to 4 inches in thickness. It is pale brown, light gray, or light brownish gray and has a hue of 10YR. It is fine sandy loam, very fine sandy loam, or loam. Reaction is medium acid to mildly alkaline.

The B2t horizon ranges from 15 to 36 inches in thickness. It is yellowish brown or dark yellowish brown and has a hue of 10YR or is brown or dark brown and has a hue of 7.5YR. It has strong to weak, coarse prismatic structure, to weak to strong angular blocky

The C horizon is variable alluvial deposits. In most pl[illegible] structured, and ranges [illegible] sandy loam to loam and may be cobbly, stony, gravelly, or very gravelly.

MdI—Milpitas stony fine sandy loam, 2 to 9 percent slopes. This gently sloping to moderately sloping soil is on terraces. It has a profile similar to the one described as representative of the series, but the surface layer and subsoil contain about 20 to 30 percent water-rounded cobbles, stones, and boulders derived from sandstones. The cobbles, stones, and boulders range from less than 6 inches to 8 feet in diameter and are numerous enough to make the use of all farm implements impractical.

Included with this soil in mapping are some terraces that have a reddish clay subsoil similar to Positas soils, and other small areas of Milpitas soils that are nearly free of stones.

Runoff is medium, and the hazard of erosion is moderate. Available water capacity is 4 to 6 inches. Effective rooting depth is 20 to 28 inches.

This soil is used for urban development and range. Capability unit IVs–3 (19,15); Claypan range site.

MdII—Milpitas stony fine sandy loam, 9 to 15 percent slopes. This strongly sloping soil is extensive on terraces dissected by drainageways. It has a profile similar to the one described as representative of the series, but the surface layer and subsoil contain 20 to 30 percent water-rounded cobbles, stones, and boulders derived from sandstone. The cobbles, stones, and boulders range from less than 6 inches to 8 feet in diameter and are numerous enough to make the use of all farm implements impractical (fig. 9).

Included with this soil in mapping are some terraces that have a reddish clay subsoil similar to that in Positas soils. Also included are small areas of Milpitas or Positas soils that have no stones.

Runoff is rapid, and the hazard of erosion is high. Available water capacity is 4 to 6 inches. Effective depth is 18 to 28 inches.

This soil is used for urban development and range. Capability unit IVs–3 (19,15); Claypan range site.

MdE—Milpitas stony fine sandy loam, 15 to 30 percent slopes. This moderately steep soil is on terraces where it is dissected. It has a profile similar to the one described as representative of the series, but the surface layer and subsoil contain 25 to 35 percent water-rounded cobbles, stones, and boulders derived from sandstone, and depth to the clay subsoil is 2 to 4 inches less. The cobbles, stones, and boulders range from less than 6 inches to 8 feet in diameter.

[illegible] terraces that have a reddish clay subsoil similar to that in Positas soils and other small areas of Milpitas or Positas soils that have no stones.

Runoff is very rapid, and the hazard of erosion is very high. Available water capacity is 3.5 to 6 inches. Effective rooting depth is 16 to 26 inches.

This soil is used for urban development and range. Capability unit VIe 1 (19,15); Claypan range site.

MfE—Milpitas stony fine sandy loam, 30 to 50 percent slopes. This steep soil is in narrow strips of land typically between terraces of different levels. It has a profile similar to the one described as representative of the series, but it contains 25 to 35 percent water-rounded cobbles, stones, and boulders derived from sandstone. The cobbles, stones, and boulders range [illegible] diameter. Depth to the clay subsoil is unpredictable but typically is 6 to [illegible] than the less sloping Milpitas soils. Included in mapping are small spots of nearly stone-free Milpitas and Positas soils.

Runoff is very rapid, and the hazard of erosion is very high. Available water capacity is 3 to 5.5 inches. Effective rooting depth is 12 to 24 inches.

This soil is used for range and urban development. Capability unit VIe 1 (19,15); Claypan range site.

MeI—Milpitas-Positas fine sandy loams, 2 to 9 percent slopes. [illegible] complex consists of 45 percent Milpitas fine sandy loam and 40 percent Positas fine sandy loam. These gently sloping and moderately sloping soils are on terraces in unpredictable patterns [illegible] areas of eroded soils. The erosion resulted from cultivation. Most eroded areas are not well defined.

Milpitas soil has the profile described as representative of the series. Runoff is medium, and the hazard of erosion is moderate. Available water capacity is 4 to 6 inches. Effective rooting depth is 22 to 30 inches.

Positas soil has a profile similar to the one described as representative of the series, but it is 6 to 12 inches deeper to the clay subsoil. Runoff is medium, and the hazard of erosion is moderate. Available water capacity is 3 to 5 inches. Effective rooting depth is 18 to 28 inches.

These soils are used for urban development, range, lemons, and avocados. Capability unit IIIe–3 (19,15); Claypan range site.

MeD2—Milpitas-Positas fine sandy loams, 9 to 15 percent slopes, eroded. This complex consists of 45 percent Milpitas fine sandy loam and 40 percent Positas fine sandy loam. These strongly sloping soils

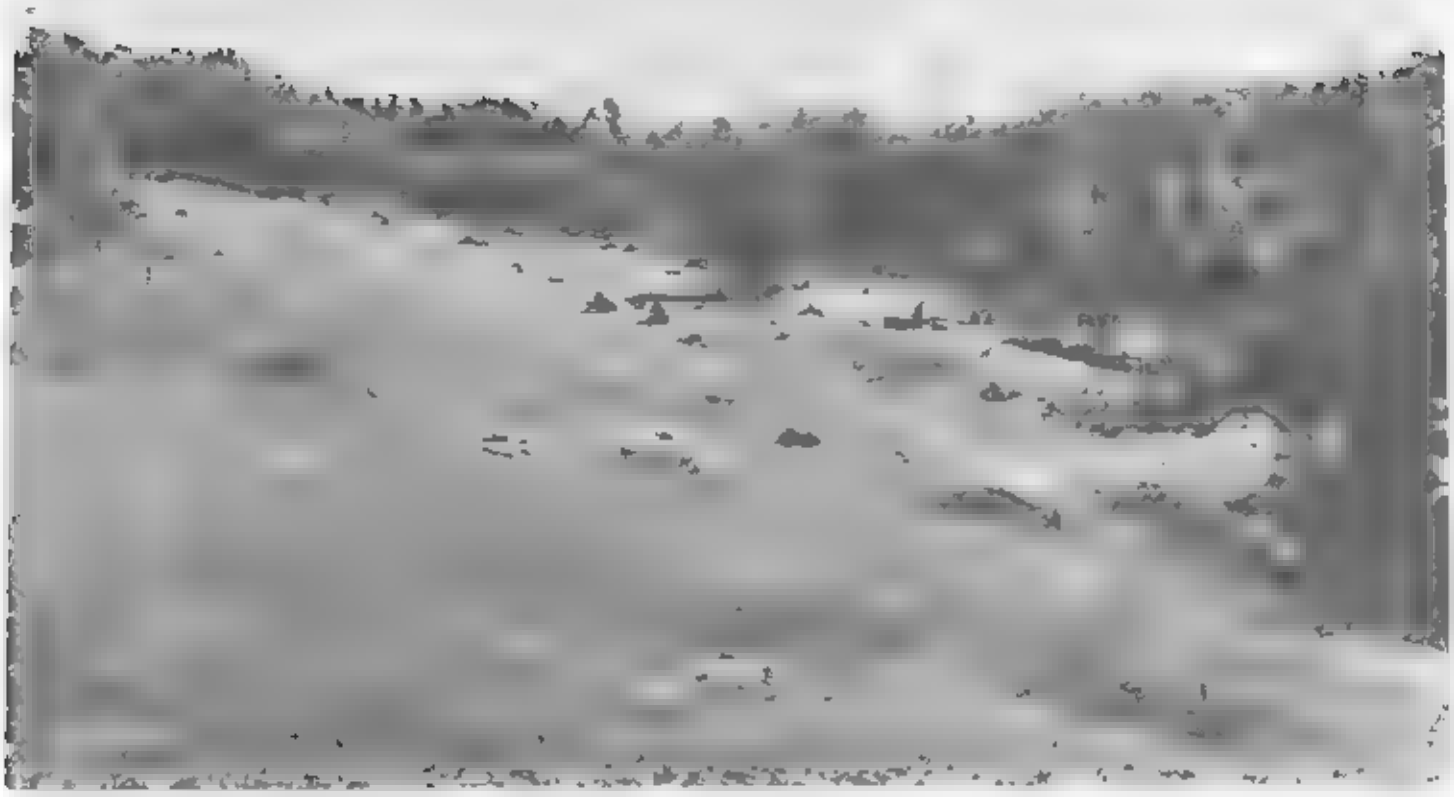

Figure 9.—Area of Milpitas stony fine sandy loam, 9 to 15 percent slopes. The surface is covered with numerous cobbles, stones, and large boulders.

are on terraces. They are in unpredictable patterns. Included in mapping are small areas of Milpitas stony fine sandy loam and areas that are not eroded or are slightly eroded. Also included are a few small severely eroded spots.

Milpitas soil has the profile described as representative of the series, but most areas have had 6 to 22 inches of soil removed by erosion. Runoff is rapid, and the hazard of erosion is high. Available water capacity is 3 to 5.5 inches. Effective rooting depth is 8 to 24 inches.

Positas soil has the profile described as representative of the series. Runoff is rapid, and the hazard of erosion is high. Available water capacity is 2 to 5 inches. Effective rooting depth is 6 to 22 inches.

These soils are used for urban development, range, lemons, and avocados. Capability unit IVe-3 (19,15); Claypan range site.

MeE2—Milpitas-Positas fine sandy loams, 15 to 30 percent slopes, eroded. This complex consists of 45 percent Milpitas fine sandy loam and 40 percent Positas fine sandy loam. These moderately steep dissected soils are on terraces. They are in unpredictable patterns. Included in mapping are small areas of Milpitas stony fine sandy loam and Ayar, Zaca, and Diablo soils. Also included are areas of soils that have slight or no erosion and small spots of severely eroded soils.

Milpitas soil has a profile similar to the one described as representative of the series, but most areas have had 8 to 24 inches of soil removed by erosion. Runoff is very rapid, and the hazard of erosion is very high. Available water capacity is 3 to 5 inches. Effective rooting depth is 6 to 22 inches.

Positas soil has a profile similar to the one described as representative of the series, but most areas have had 4 to 18 inches of soil removed by erosion. Runoff is very rapid, and the hazard of erosion is very high. Available water capacity is 2 to 5 inches. Effective rooting depth is 6 to 20 inches. These soils are used for urban development, range, lemons, and avocados. Capability unit VIe-1 (19,15); Claypan range site.

MeF2—Milpitas-Positas fine sandy loams, 30 to 50 percent slopes, eroded. This complex consists of 40 percent Milpitas fine sandy loam and 40 percent Positas fine sandy loam. These steep dissected soils are on terraces. They are in unpredictable patterns. Included in mapping are small areas of Milpitas stony fine sandy loam and Ayar, Diablo and Zaca soils. Also included are areas of soils that are not eroded and spots of severely eroded soils.

Milpitas soil has the profile described as representative of the series, but most areas have had 8 to 24 inches of soil removed by erosion. Runoff is very rapid, and the hazard of erosion is very high. Available water capacity is 2 to 5 inches. Effective rooting depth is 4 to 20 inches.

Positas soil has a profile similar to the one de-

scribed as representative of the series, but most areas have had 6 to 20 inches of soil removed by erosion. Runoff is very rapid, and the hazard of erosion is very high. Available water capacity is 2 to 4.5 inches. Effective rooting depth is 4 to 18 inches.

These soils are used for range, wildlife habitat, and urban development. Capability unit VIIe-1(19,15); Claypan range site.

Montara Series

The Montara series consists of well drained soils on uplands. They formed in material weathered from massive, hard, serpentine rock. Slope ranges from 15 to 50 percent. Elevation is 300 to 2,000 feet. Vegetation is annual grasses and forbs. Average annual precipitation is 14 to 24 inches, mean annual air temperature is 57° to 61° F., and the frost free season is 300 to 320 days.

In a representative profile the surface layer is dark gray stony light clay about 18 inches thick over hard olive serpentine rock. Reaction is moderately alkaline.

Permeability is moderately slow. Available water capacity is 1.5 to 3 inches. Effective rooting depth is 10 to 20 inches.

These soils are used for range, wildlife habitat, and watershed.

Representative profile of Montara stony clay, 15 to 50 percent slopes, eroded, on a site under wild oats, tarweed, soft chess, and other annual grasses and weeds, approximately ¾ mile north and 1 mile east of Vandenberg Air Force Base boundary and Miguelito Road crossing.

A11—0 to 1 inches; dark gray (10YR 4/1) stony light clay, black (10YR 2/1) moist; moderate medium granular structure; hard, friable, sticky and very plastic; common very fine roots; common very fine interstitial pores; 10 to 15 percent, by volume, gravel-size serpentine fragments; 5 to 10 percent of surface covered with detached stones and boulders; moderately alkaline; very abrupt smooth boundary.

A12—1 to 18 inches; dark gray (10YR 4/1) light clay, black (10YR 2/1) moist; strong very few fine and common very fine roots; hard, friable, sticky and very plastic, very fine and common very fine roots; few very fine tubular pores and common fine and very fine interatitial pores; 10 to 15 percent, by volume, gravel-size serpentine fragments; moderately alkaline; very abrupt wavy boundary.

R—18 inches; olive hard serpentine bedrock.

The A horizon is 10 to 20 inches thick. It is dark gray or very dark gray and has a hue of 10YR. It is heavy clay loam to clay. It has blocky or prismatic structure, and the top few inches are commonly granular.

Montara soils in the survey area contain 5 to 10 percent more clay than defined as the range for the series, but this difference does not greatly alter the use and management of the soils.

MtF2—Montara stony clay, 15 to 50 percent slopes, eroded. This moderately steep or steep soil is on mountains. Some areas have had 1 to 4 inches of the surface layer removed by erosion and small gullies are present. Rock outcrop and scattered rocks and boulders are throughout this soil but are most common in drainageways and on ridges. Included in mapping are small areas of Los Osos and Diablo soils.

Runoff is medium, and the hazard of erosion is moderate.

This soil is used for range. Capability unit VIIs-1(15); Shallow Loamy range site.

Nacimiento Series

The Nacimiento series consists of well drained soils on low rolling foothills. The soils formed in material weathered from soft marly shale or mudstone. Slope ranges from 30 to 75 percent. Elevation is 100 to 1,000 feet. Vegetation is annual grasses and forbs, principally wild oats, ripgut brome, and mustard. Average annual precipitation is 16 to 20 inches, mean annual air temperature is 60° to 62° F., and the frost free season is 300 to 320 days.

In representative profile the surface layer is grayish brown and dark grayish brown silty clay loam about 19 inches thick. The underlying material to a depth of 34 inches is grayish brown silty clay loam and to a depth of 42 inches is yellowish brown clay loam. Below this is olive brown soft marly mudstone. These soils are moderately alkaline and calcareous throughout.

Permeability is moderately slow. Available water capacity is 7 to 9.5 inches. Effective rooting depth is 40 to 50 inches.

These soils are used for range.

Representative profile of Nacimiento silty clay loam, 30 to 50 percent slopes, eroded, on a site under annual grasses and forbs, used for range, on Hollister Ranch, approximately 1 mile north of Rancho Real Road and 0.4 mile west from Canada de la Cuarta Road entrance:

A11—0 to 6 inches; grayish brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium subangular blocky structure parting to strong fine and medium granular; hard, friable, sticky and plastic; many very fine and fine roots; many very fine interstitial pores; strongly effervescent with disseminated lime; moderately alkaline; clear wavy boundary.

A12—6 to 19 inches; dark grayish brown (2.5Y 4/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium and coarse subangular blocky structure parting to weak medium granular; hard, friable, sticky and plastic; common very fine and fine roots; many very fine interstitial pores and many very fine tubular pores, strongly effervescent with disseminated lime; moderately alkaline; clear wavy boundary.

C1ca—19 to 34 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse sub-

angular blocky structure; hard, friable, sticky and plastic; common very fine roots; many very fine interstitial pores and many very fine tubular pores; violently effervescent with disseminated lime and lime in filaments and threads; moderately alkaline; gradual wavy boundary.

C2ca—34 to 42 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; weak coarse subangular blocky structure; very hard, very friable, sticky and plastic; few very fine roots; many very fine interstitial pores and many very fine tubular pores; violently effervescent with 10 to 15 percent of mass in soft powdery filaments and threads of lime; moderately alkaline; clear wavy boundary.

C3r—42 to 60 inches; olive brown (2.5Y 4/4) soft marly mudstone that can be dug with hand tools.

The A horizon typically has dry colors of dark grayish brown, grayish brown, or very dark grayish brown in a hue of 2.5Y. It is 12 to 20 inches thick. The C horizon is grayish brown or yellowish brown that has a hue of 10YR or light olive brown or olive brown in a hue of 2.5Y. It is silty clay loam or clay loam. Depth to mudstone ranges from about 40 inches on some ridges to 50 inches on side slopes. Typically it is deepest in concave areas or near toe slopes. Cracks are common when the soil is dry although slickensides are seldom present. In the C horizon free lime is present as many threads and filaments. A few coarse fragments of gravel or cobble size, typically less than 1 percent by volume, may be present throughout the soil.

Nacimiento soils in the survey area are more than 40 inches deep to bedrock, which is greater than is defined as the range for the series. This difference does not greatly alter the use and management of these soils.

NaF2—Nacimiento silty clay loam, 30 to 50 percent slopes, eroded. This steep soil is in scattered parts of a long narrow band of Nacimiento soils that parallels the coastline of the Pacific Ocean about 1 mile from the ocean. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Linne and Ayar soils and a soil similar to Nacimiento that is not calcareous in the surface layer but may be calcareous in the underlying material. Also included are some ridgetops that have soil less than 40 inches deep to bedrock.

This soil is highly susceptible to slippage and most areas have 10 to 50 percent of the surface affected by landslides. Many of these landslides are shown on the map by ad hoc symbol.

Runoff is rapid, and the hazard of erosion is high.

This soil is used for range. Capability unit VIe-1(19,15); Clayey range site.

NbG—Nacimiento complex, landslide, 30 to 75 percent slopes. This steep and very steep soil is on uplands in a long narrow band that parallels the Pacific Ocean about 1 mile from the coast. It has a profile similar to the one described as representative of the series, but 50 percent or more of the surface is affected by landslides (fig. 10). The landslide areas are variable in age, many are fairly stable, and some are recent and active. Landslides typically consist of two parts: the upper part is a steep scar that remains where the soil has slid away; and the lower part is a wrinkled, uneven accumulation of slipped soil material.

Included with this complex in mapping are small areas of Linne, Ayar, and Zaca soils. Also included are a soil that is similar to Nacimiento soil but not calcareous in the surface layer but may be calcareous in the substratum, and some ridgetops that have soil less than 40 inches deep to bedrock.

Runoff on Nacimiento soil is rapid, and the hazard of erosion is very high. This soil is highly unstable because of its tendency to slip.

Runoff on landslides is very rapid, and the hazard of erosion is very high. Available water capacity is variable. Effective rooting depth is variable.

This complex is used for range. Capability unit VIIe-1(15); Clayey range site.

Orthents

OAG—Orthents, 50 to 75 percent slopes, are on steep and very steep terrace escarpments. These soils typically are in long, narrow, irregularly shaped bodies fairly well stabilized by brush or oatgrass cover. Soil material varies considerably within short distances, but in most places is stony fine sandy loam.

Permeability is moderate, and available water capacity is moderate to low. Runoff is very rapid, and the hazard of erosion is very high.

This soil is typically brush-covered and used for watershed. A few areas are used for avocados. Capability unit VIIe-1(19,15).

Pits and Dumps

PA—Pits and dumps consists of pits from which raw materials are taken in mining and dump areas for the waste material from these pits. Most mining done in this area is for diatomaceous earth in the Santa Ynez Mountains near Lompoc. These deposits occupy large areas and are several hundred feet thick. They are made up of microscopic algae that leave their siliceous skeletal deposits. Other mining operations include a large rock quarry along Rincon Creek and several other borrow areas throughout the area. The hazard of erosion in these areas is very high and erosion control is needed to prevent sedimentation on lower-lying land.

This land has little agricultural value, but has value as a source of raw material. Onsite investigation is needed.

Positas Series

The Positas series consists of moderately well drained soils on old dissected terraces. The soils formed in mixed alluvial deposits. Slope ranges from 2 to 50 percent. Elevation is 30 to 800 feet. Vegetation is annual grasses, brush, and scattered oak trees. Average annual precipitation is 16 to 20 inches, mean

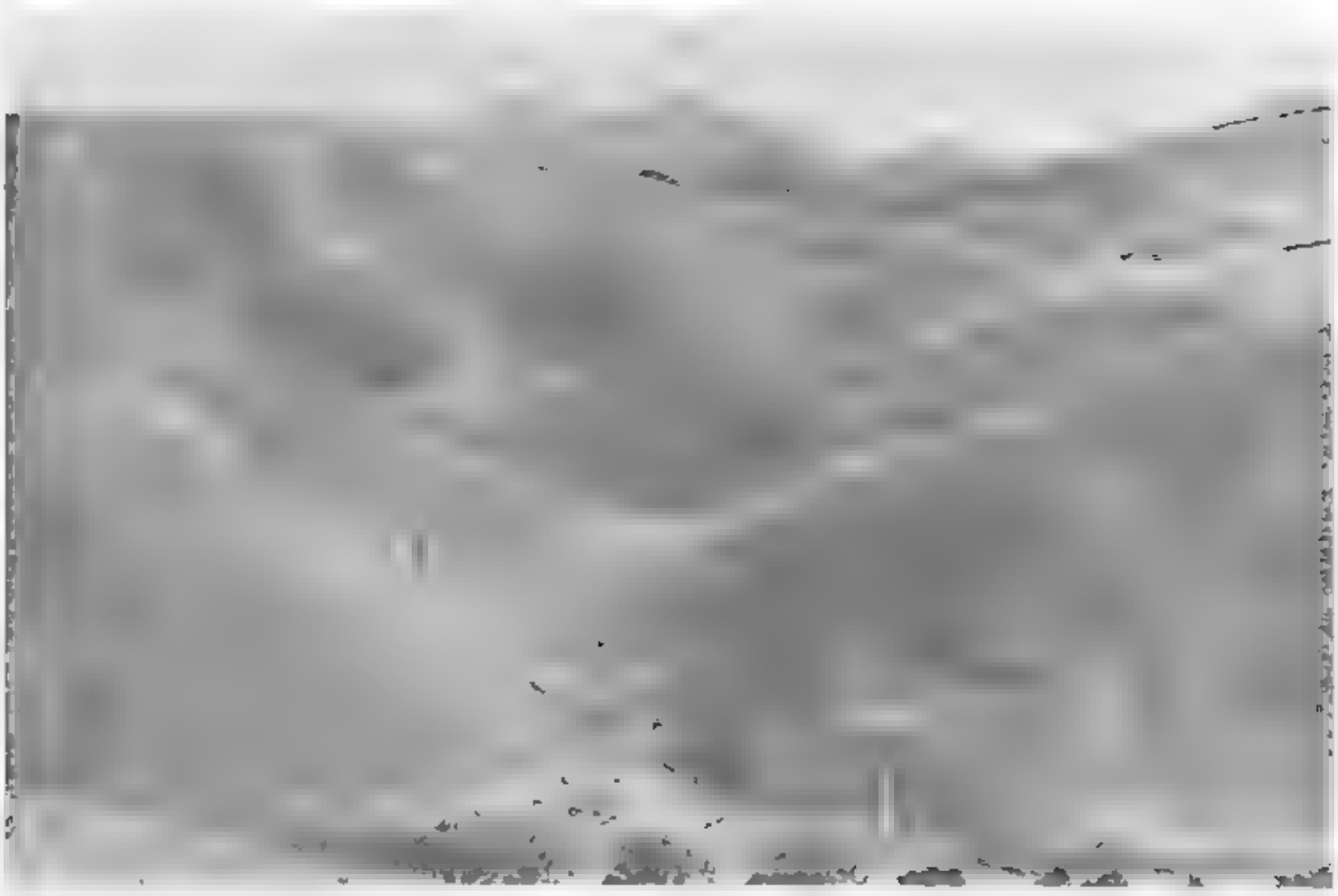

Figure 10.—Fifty percent or more of the surface of Nacimiento complex, landslide, 30 to 75 percent slopes, is subject to landslides.

annual air temperature is 60° to 61° F., and the frost-free season is 300 to 330 days.

In a representative profile, the surface layer is brown fine sandy loam about 17 inches thick. The subsurface layer is pale brown fine sandy loam about 2 inches thick. The upper part of the subsoil is reddish brown clay about 22 inches thick. The lower part to a depth of 60 inches or more is dark reddish brown heavy clay loam. Reaction in the surface layer is slightly acid. The upper part of the subsoil is slightly acid to neutral, and the lower part of the subsoil is moderately alkaline. Permeability is very slow.

This soil is used for range, urban development, and lemons.

Positas soils are mapped only as a complex with Milpitas soils.

Representative profile of Positas fine sandy loam in an area of Milpitas-Positas fine sandy loams, 9 to 15 percent slopes, eroded, on a site that was a lemon orchard and is now covered with annual grasses and weeds in Santa Barbara City about 3,200 feet north of intersection of State Street and Hope Avenue, 200 feet east of Hope Avenue on driveway and 50 feet north in field:

Ap—0 to 5 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; massive; hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine and fine interstitial pores; slightly acid; clear wavy boundary.

A12—5 to 17 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; massive; hard, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine interstitial pores and many very fine and fine tubular pores; slightly acid; clear wavy boundary.

A2—17 to 19 inches, pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; massive; hard, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine interstitial pores and common very fine tubular pores; slightly acid; abrupt smooth boundary.

B21t—19 to 32 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/3) moist; strong coarse prismatic structure,

very hard, extremely firm, very sticky and very plastic, very few very fine roots concentrated along ped faces; few very fine interstitial pores and very few tubular pores; continuous thick clay films line pores; slightly acid; gradual wavy boundary.

B3t—41 to 68 inches; dark reddish brown (5YR 3/3) heavy clay loam, dark reddish brown (5YR 3/2) moist; massive; very hard, very firm, sticky and plastic; no roots; common very fine interstitial pores; many moderately thick clay films; moderately alkaline.

The A1 horizon in most places is brown and has a hue of 10YR or 7.5YR but may be grayish brown in a hue of 10YR. It is fine sandy loam or loam. Depth to the B2t horizon ranges from 14 to 26 inches although spots of soils that are severely eroded may lack an A horizon or may be only a few inches thick. Reaction is slightly acid or neutral.

The A2 horizon is typically distinct and may tongue into the B2t horizon. It is pale brown, light brown, or [illegible] gray and has a hue of 10YR or 7.5YR. It ranges from 1 to 3 inches in thickness. Reaction is medium acid to slightly acid.

[illegible] brown and has a hue of 5YR. It is clay and sandy clay 18 to 36 inches thick. The B2t horizon has strong coarse prismatic structure to medium moderate subangular blocky. Reaction is slightly acid to neutral.

The B3 horizon or C horizon is reddish brown or dark reddish brown and has a hue of 5YR. The texture is variable and ranges from sandy loam to clay loam. Reaction is neutral to moderately alkaline. Lime in seams may be present.

Water-rounded quartzite gravel and cobbles make up about 1 to 15 percent of the material in the profile.

Riverwash

RA—Riverwash consists of sandy, gravelly, stony, and bouldery stream channels that overflow during the rainy season and are dry at other times. It is subject to scouring, deposition, and removal.

Some areas are nearly devoid of vegetation except for a few clumps of sagebrush and scattered willows. Other areas are covered with sycamore, oak trees, or brush cover. These wooded areas include some deeply entrenched major drainageways.

This miscellaneous area has no agricultural use but is valuable as a source of sand and gravel. Some areas are valuable as a refuge for wildlife. Capability unit VIIw–1 (19,20)

Rock Outcrop

Rock outcrop consists of very steep and extremely steep mountainous areas that have exposed sandstone, shale, or conglomerate formations. Slope ranges from 50 to 100 percent. Elevation is 200 to 4,700 feet. Vegetation is very sparse chaparral brush, predominately chamise and ceanothus. Some areas mapped in complex with Lopez and Capitan soils have sparse California sage or black sage cover. Average annual precipitation is 18 to 30 inches, mean annual air temperature is 57° to 62° F., and the frost free season is 250 to 310 days.

In a representative profile, 70 to 95 percent of the surface is Rock outcrop with a thin mantle of soil less than 15 inches thick between rock outcrops. Available water capacity is 0 to 1.5 inches, and effective rooting depth is 0 to 15 inches. Runoff is excessive, and permeability is slow.

Rock outcrop is used for watershed, wildlife habitat, and recreation. It is mapped in complex with Capitan, Gaviota, Lodo, Lopez, and Maymen soils. In most places the soil mantle in Rock outcrop is the same as the soil mapped in the complex.

Rh—Rock outcrop-Maymen complex, 75 to 100 percent slopes. This extremely steep complex is in the highest, steepest parts of the Santa Ynez range. It consists of about 70 percent Rock outcrop and 25 percent Maymen soil. Rock outcrop occupies most of the area as out-thrusts of tilted hard sandstone and conglomerate. Maymen soils are in small irregular bends between Rock outcrops. About 5 percent Lodo and Gaviota soils are included in some areas.

Rock outcrop is very steep and extremely steep mountainous areas that have exposed sandstone, shale, or conglomerate formations. Available water capacity is 0 to 1.5 inches, and effective rooting depth is 0 to [illegible] inches. Runoff is very rapid, and the hazard of erosion is very high.

Maymen soils have a profile similar to the one described as representative of the series. Runoff is very rapid, and the hazard of erosion is very high. Available [illegible] inches. Effective rooting depth is 6 to 18 inches.

This complex is used for watershed, wildlife habitat, and recreation. Capability unit VIIIs–1 (15,20)

San Andreas Series

The San Andreas series consists of well drained soils on low rolling uplands. The soils formed in material weathered from soft sandstone. They are so intermingled with [illegible] soils that it is impractical to map them separately. They are mapped only as a complex with Tierra soils in this survey area. Slope ranges from 9 to 50 percent. Elevation is 500 to 1,900 feet. Vegetation is brush, annual grasses, forbs, and scattered oaks. Average annual precipitation is 16 to 22 inches, mean annual air temperature is 60° to 63° F., and the frost free season is 310 to 330 days.

In a representative profile the surface layer is dark [illegible] fine sandy loam about 12 inches thick. The subsoil is dark grayish brown, very fine sandy loam and loam about 16 inches thick. The substratum is strong brown soft sandstone that extends to 60 inches and more. Reaction is medium acid throughout. Permeability is moderately rapid.

These soils are used for range, urban development, or orchards.

Representative profile of San Andreas fine sandy loam in an area of San Andreas-Tierra complex, 9 to 15 percent slopes, eroded, on a site under annual grass cover, approximately 4,400 feet west and 2,600 feet north of Sudden Peak on Miguelito roadbank:

A11—0 to 1 inches; grayish brown (10YR 5/2)

fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine and fine interstitial pores; medium acid; clear smooth boundary.

A12—1 to 12 inches; dark grayish brown (10YR [illegible] fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive, [illegible] very friable, slightly sticky and slightly plastic; [illegible] roots; many very fine tubular pores and many very fine and fine interstitial pores; medium acid; clear wavy boundary.

B21—12 to 20 inches; dark grayish brown (10YR 4/2) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive, hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine interstitial pores and [illegible] few thin clay films in pores; medium acid; gradual wavy boundary.

B22—20 to 28 inches, dark grayish brown (10YR 4/2) loam, dark brown (10YR 3/3) moist; massive; hard, friable, sticky and slightly plastic; few very fine roots; common very fine interstitial pores and common very fine and fine tubular pores; few thin clay films in pores; medium acid; clear wavy boundary.

Cr—28 to 60 inches; strong brown (7.5YR 5/8) sandstone; can be broken with fingers and dug with handtools

The A horizon typically consists of grayish brown, dark grayish brown, or brown in a hue of 10YR. It is sandy loam or fine sandy loam 8 to 18 inches thick. The B horizon consists of grayish brown, brown, or dark grayish brown in a hue of 10YR. It is fine sandy loam, very fine sandy loam, or loam. The B horizon contains up to 10 percent sandstone rock fragments. Rodent activity caused some mixing of the lower part of the A horizon and the upper part of the B horizon. Sandstone bedrock is at a depth of 24 to 40 inches. In most places, the sandstone can be dug with handtools, but with some difficulty.

SaD2—San Andreas-Tierra complex, 9 to 15 percent slopes, eroded. This complex is on the low hills. It consists of about 60 percent San Andreas fine sandy [illegible] 20 percent Tierra [illegible] loam, 10 percent soils similar to San Andreas soil but having a clay loam subsoil; and 10 percent Gaviota, Arnold, and Los Osos soils. San Andreas soil typically is on ridgetops and Tierra soil is on concave areas where water has collected and greater mineral weathering has occurred. Deep gullies are in most drainageways and slopes have many rills and gullies resulting from former cultivation. Some ridgetops have little or no soil remaining.

The San Andreas soil has the profile described as representative of the series. Runoff is medium, and the hazard of erosion is moderate. Available water capacity is 3.5 to 7 inches. Effective rooting depth is 24 to 40 inches.

The Tierra soil has the profile described as representative of the series. Runoff is rapid, and the hazard of erosion is high. Available water capacity is 2.5 to 3.5 inches. Effective rooting depth is 12 to 20 inches.

This complex is used for range, orchards, and urban development. Capability unit IVe–1(19,15); San Andreas soil is in Loamy range site, Tierra soil is in Claypan range site.

SaE2—San Andreas-Tierra complex, 15 to 30 percent slopes, eroded. This complex is on low hills. It consists of about 50 percent San Andreas fine sandy loam; 20 percent Tierra sandy loam; 15 percent of a soil similar to San Andreas that has a clay loam subsoil; and 15 percent Gaviota, Arnold, and Los Osos soils. San Andreas soil is on ridgetops and convex areas. Tierra soil is on concave areas where water from rainfall is most concentrated and greater mineral weathering has occurred. Deep gullies are in drainageways and slopes have many rills and gullies resulting from former cultivation. Some ridgetops have little or no soil remaining. Some areas have slight erosion and small areas that are severely eroded.

The San Andreas soil has a profile similar to the one described as representative of the series. Runoff is medium, and the hazard of erosion is moderate. Available water capacity is 3.5 to 6 inches. Effective rooting depth is 24 to 36 inches.

The Tierra soil has a profile similar to the one described as representative of the series. Runoff is rapid, and the hazard of erosion is high. Available water capacity is 2 to 3.5 inches. Effective rooting depth is 10 to 20 inches.

This complex is used for range, orchards, and urban development. Capability unit VIe–1(19,15); San Andreas soil is in Loamy range site, Tierra soil is in Claypan range site.

SaF2—San Andreas-Tierra complex, 30 to 50 percent slopes, eroded. This complex consists of about 50 percent San Andreas [illegible] 30 percent [illegible] loam, 10 percent soils similar to San Andreas but having a clay loam subsoil; and 10 percent Gaviota, Arnold, Los Osos, and Santa Lucia soils. San Andreas soil is on side slopes and ridgetops. Tierra soil is on concave swales and [illegible]. Most areas have deep gullies and [illegible] Some ridgetops have little or no soil remaining. Some areas are only slightly eroded.

San Andreas soil has a profile similar to the one described as representative of the series, but it averages 3 to 10 inches shallower to bedrock. Runoff is rapid, and the hazard of erosion is high. Available water capacity is 2.5 to 5 inches. Effective rooting depth is 24 to 30 inches.

Tierra soil has a profile similar to the one described as representative of the series, but it averages 2 to 4 inches shallower to the clay subsoil. Runoff is very rapid, and the hazard of erosion is very high. Available water capacity is 2 to 4.5 inches. Effective rooting depth is 6 to 18 inches.

This complex is used for range and urban development; small areas are used for orchards. Capability unit VIIe–1(19,15); San Andreas soil is in Loamy range site, Tierra soil is in Claypan range site.

Sanitary Landfill Areas

SB—Sanitary landfill areas consists of disposal areas for garbage and other refuse in deep canyons. Layers of refuse and soil material alternate. Typically about 6 feet of refuse and one foot of soil are layered until the prescribed areas are filled.

In the operation of Sanitary landfill, the fill, as well as the borrow area, is bare and exposed to winter rains. The large amount of bare, unprotected land makes the hazard of erosion severe during winter rains. Onsite investigation is needed.

Santa Lucia Series

The Santa Lucia series consists of well drained soils on foothills and mountains. The soils formed in material weathered from Monterey Shale. Slope ranges from 9 to 75 percent. Elevation is 100 to 1,100 feet. Vegetation is sagebrush, oaks, scattered forbs, and annual grasses. Average annual precipitation is 16 to 20 inches, mean annual air temperature is 58° to 60° F., and the frost free season is 300 to 330 days.

In a representative profile the upper part of the surface layer is dark gray shaly clay loam about 12 inches thick and the lower part is dark gray very shaly clay loam about 12 inches thick. White shale of the Monterey Formation is at a depth of 24 inches. Reaction in the upper part of the surface layer is slightly acid and in the lower part is strongly acid. Permeability is moderate.

These soils are used for watershed, range, and dryland grain.

Representative profile of Santa Lucia shaly clay loam, 30 to 50 percent slopes, eroded, on a site under California sagebrush, annual grasses, and forbs on the Hollister Ranch, on Rancho Real road cut, approximately 1,100 feet west of entrance to Santa Cruz Island:

A11—0 to 12 inches; dark gray (10YR 4/1) shaly clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, very friable, sticky and plastic; common medium and many very fine and fine roots; many very fine and fine and few medium interstitial pores; about 30 percent, by volume, coarse shale fragments with about 80 percent less than 3 inches in diameter; slightly acid; gradual wavy boundary.

A12—12 to 24 inches; dark gray (10YR 4/1) very shaly clay loam, very dark gray (10YR 3/1) moist; moderate fine and medium granular structure; slightly hard, very friable, sticky and plastic; few medium and many very fine and fine roots; many very fine and fine interstitial pores; about 60 percent, by volume, coarse shale fragments with about 60 percent under 3 inches in diameter; strongly acid; abrupt wavy boundary.

R—24 to 36 inches; highly fractured Monterey Shale. Rock color is white to light gray and may be coated with thin brown clay films.

The A horizon is typically dark gray but may be gray in a hue of 10YR. Depth to bedrock ranges from 20 inches near ridgetops to about 40 inches on some toe slopes. In most places the lower part of the A horizon is dark gray, but in some profiles thin reddish or brownish coatings are on shale fragments. The percentage of coarse fragments generally increases with depth. The amount of coarse fragments in the upper 8 to 14 inches ranges from 15 to 50 percent, by volume, with 10 to 30 percent of the coarse fragments more than 3 inches in diameter. The rest of the soil down to bedrock contains 40 to 75 percent, by volume, coarse fragments with 20 to 50 percent of the coarse fragments more than 3 inches in diameter. All shale fragments are flaggy and brittle, typically less than 3 inches thick, and seldom more than 10 inches across. Steeper mapping units may have 10 to 30 percent of the surface littered with shale fragments.

ScD2—Santa Lucia shaly clay loam, 9 to 15 percent slopes, eroded. This strongly sloping soil is in bands that parallel the Pacific Ocean, typically within ¾ mile of the coastline. It has the profile described as representative of the series, but it is 4 to 10 inches deeper to bedrock. Cultivation of soil has resulted in moderate to severe sheet erosion in most areas. A few areas have had slight erosion. Included in mapping are small areas of Lopez, Concepcion, and Linne soils and soils that are similar to Santa Lucia soils, but are dark brown or dark grayish brown.

Runoff is medium, and the hazard of erosion is moderate. Available water capacity is 3.5 to 5.5 inches. Effective rooting depth is 24 to 40 inches.

This soil is used for dryland grain and range. Capability unit IIIe–1(19,15); Loamy range site.

ScE2—Santa Lucia shaly clay loam, 15 to 30 percent slopes, eroded. This moderately steep soil is in irregular bands paralleling the Pacific Ocean, typically within ¾ mile of the coastline. It has a profile similar to the one described as representative of the series, but it is typically 2 to 6 inches deeper to bedrock. Cultivated areas have uneven surfaces because of erosion, and bedrock is exposed in some spots.

Included with this soil in mapping are small areas of Lopez, Capitan, and Linne soils. Also included are soils that are similar to Santa Lucia soils but are grayish brown or dark grayish brown and areas that are not eroded.

Runoff is rapid, and the hazard of erosion is high. Available water capacity is 2.5 to 5 inches. Effective rooting depth is 24 to 36 inches.

This soil is used for range and dryfarm grain. Capability unit IVe–1(19,15); Loamy range site.

ScF2—Santa Lucia shaly clay loam, 30 to 50 percent slopes, eroded. This steep soil is in bands that parallel the Pacific Ocean, typically within 1 mile of the coastline. It has the profile described as representative of the series. Most areas have uneven surfaces resulting from erosion during cultivation.

Included with this soil in mapping are small areas of Lopez, Capitan, and Linne soils. Also included are small areas of soils that are similar to Santa Lucia but are grayish brown or dark grayish brown, and some uneroded areas.

Runoff is rapid, and the hazard of erosion is high.

Available water capacity is 2 to 4 inches. Effective rooting depth is 22 to 30 inches.

This soil is used for range and watershed. Capability unit VIe-1 (19,15); Loamy range site.

SeG—Santa Lucia shaly loam, 50 to 75 percent slopes. This very steep mountainous soil parallels the Pacific Ocean, typically within 1 mile of the coastline. It has a profile similar to the one described as representative of the series, but is typically 2 to 4 inches shallower to bedrock and the surface layer is shaly loam. Included in mapping are small areas of Lopez, Cieneba, and Linne soils and Rock outcrops.

Runoff is very rapid, and the hazard of erosion is very high. Available water capacity is 2 to 4 inches. Effective rooting depth is 20 to 30 inches.

This soil is used for watershed and range. Capability unit VIIe-1 (19,15); Loamy range site.

Sespe Series

The Sespe series consists of well drained soils on mountainous uplands. The soils formed in material weathered from sandstone and shale. Slope ranges from 50 to 75 percent. Elevation is 400 to 2,600 feet. Vegetation is scattered oak and chaparral brush, but in some areas it is annual grasses, forbs, and scattered brush and oak cover. Average annual precipitation is 17 to 22 inches, mean annual air temperature is about 60° to 61° F., and the frost free season is 300 to 330 days.

In a representative profile the surface layer is dark brown clay loam about 11 inches thick. The upper part of the subsoil is dominantly reddish brown clay 12 inches thick and the lower part is reddish gray clay loam 17 inches thick. The substratum is fractured, deeply-weathered sandstone. Reaction is slightly acid in the surface layer, medium acid in the upper part of the subsoil, and moderately alkaline in the lower part of the subsoil. Lime generally is present in seams and masses in the lower part of the subsoil and in the weathered bedrock.

Permeability is slow. Available water capacity is 3.5 to 7 inches. Effective rooting depth is 24 to 40 inches.

These soils are used for watershed and range, and a few fringes of the soils are used for avocados.

The Sespe soils are mapped only as a complex with Lodo soils.

Representative profile of Sespe clay loam in an area of Lodo-Sespe complex, 50 to 75 percent slopes, on a site under chaparral brush, approximately 5,000 feet north of the intersection of Gobernador Canyon Road and State Highway 150 and 700 feet west at edge of farm road cut, approximately 2¾ miles northeast of Rincon Point:

A11—0 to 5 inches; dark brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; moderate fine granular structure; slightly hard, friable, sticky and plastic; many very fine, fine, and medium roots; many very fine interstitial pores; slightly acid; clear wavy boundary.

A12—5 to 11 inches; dark brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; weak medium granular structure; slightly hard, friable, sticky and plastic; many very fine, fine, and medium roots; many very fine interstitial pores; slightly acid; abrupt wavy boundary.

B21t—11 to 14 inches; dark reddish gray (5YR 4/2) light clay, dark reddish brown (5YR 3/2) moist; weak fine subangular blocky structure; hard, friable, sticky and plastic; common very fine, fine, and medium roots; few very fine interstitial pores; many moderately thick clay films in pores; medium acid; clear wavy boundary.

B22t—14 to 23 inches; reddish brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) moist; moderate fine subangular blocky structure; very hard, very firm, very sticky and very plastic; few very fine and medium roots; few very fine interstitial pores; many moderately thick clay films in pores; slightly effervescent with disseminated lime and lime in fine irregularly shaped filaments; moderately alkaline; gradual irregular boundary.

R—23 to 38 inches; reddish gray (5YR 5/2) clay loam, dark reddish brown (5YR 3/2) moist; weak medium subangular blocky structure; hard, very firm, sticky and plastic; few very fine, fine, and medium roots; common very fine interstitial pores; common moderately thick clay films in pores; strongly effervescent with disseminated lime and lime in seams; moderately alkaline; gradual irregular boundary.

Cr—38 to 50 inches; reddish gray (5YR 5/2) partially decomposed sandstone, massive; slightly hard, but becomes firmer with depth; few very fine, fine and medium roots; violently effervescent with medium irregular lime in soft masses and seams; moderately alkaline.

The A horizon is very dark brown and has a hue of 7.5YR or dark reddish brown or dark reddish gray in hue of 5YR. It is clay loam or light clay. In undisturbed areas the upper part of the A horizon has granular structure; the lower part has subangular blocky structure. In cultivated areas structure is typically weak to moderate subangular blocky.

The B horizon is reddish brown, dark reddish brown, dark reddish gray, reddish gray, yellowish red, or dusky red and has a hue of 5YR or 2.5YR. It is light clay or clay. Typically it has weak or moderate subangular blocky structure. Reaction is slightly acid to moderately alkaline. The lower part of the B horizon is calcareous in some areas and noncalcareous in others. Soils on ridges tend to be 24 to 30 inches deep to fine sandstone bedrock and soils on side hills and lower slopes tend to be 30 to 40 inches deep to weathered soft sandstone or shale bedrock. Some areas contain up to 15 percent sandstone cobbles, stones, or boulders in all parts of the profile.

The Cr horizon is sandstone or shale and is usually shattered and decomposed for several feet. Some areas are underlain by shattered hard sandstone, shale, or conglomerate.

Soboba Series

The Soboba series consists of excessively drained soils in long narrow valleys intermingled with Elder soils and Riverwash. The soils formed in recently deposited coarse textured, stony, and gravelly alluvium derived from sandstone. Slope ranges from 2 to 9 percent. Elevation is 50 to 400 feet. Vegetation is annual grasses, forbs, and scattered oak trees. Average annual precipitation is 16 to 20 inches, mean annual air temperature is 60° to 62° F., and the frost free season is 310 to 330 days.

In a representative profile, the surface layer is pale brown stony coarse sandy loam about 8 inches thick. The underlying material is pale brown stony loamy coarse sand, and light yellowish brown very gravelly sand to a depth of 60 inches or more. Reaction is mildly alkaline throughout.

Permeability is very rapid. Available water capacity is 2 to 3 inches. Effective rooting depth is more than 60 inches.

These soils are used for avocados and lemons, or they are idle.

Soboba soils are mapped only as a complex with Elder soils.

Representative profile of Soboba soil on a site in an avocado orchard in Gobernador Canyon, about 2 miles northeast of Gobernador Road from Casitas Pass Road, about 100 feet north on edge of stream channel:

Ap—0 to 8 inches; pale brown (10YR 6/3) stony coarse sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; common very fine roots; many very fine interstitial pores; mildly alkaline; clear smooth boundary.

C1—8 to 17 inches; pale brown (10YR 6/3) stony coarse loamy sand, dark brown (10YR 4/3) moist; single grained, loose; non-sticky and nonplastic; common very fine roots; many very fine and fine interstitial pores; mildly alkaline; clear wavy boundary.

C2—17 to 60 inches; light yellowish brown (10YR 6/4) very gravelly sand, yellowish brown (10YR 5/4) moist; single grained, loose, nonsticky and nonplastic; common very fine roots; many fine interstitial pores; mildly alkaline.

Colors of the profile are brown, pale brown, and light yellowish brown. Locally, the A horizon in tree protected areas is grayish brown. All colors are in hue of 10YR. Reaction is neutral to mildly alkaline. The entire profile typically is cobbly, stony, gravelly, or bouldery and is coarse sandy loam, loamy sand, or sand. Coarse fragments make up 35 to 60 percent of the soil in all parts.

Tierra Series

The Tierra series consists of moderately well drained soils on dissected terraces and low rolling hills. These soils formed in old, water-deposited sediment. Slope ranges from 9 to 50 percent. Elevation is 100 to 1,600 feet. Vegetation is annual grasses and forbs, scattered sagebrush, and oak trees. Average annual precipitation is 16 to 20 inches, mean annual air temperature is 60° to 63° F., and the frost free season is 300 to 330 days.

In a representative profile the surface layer is grayish brown sandy loam about 14 inches thick. The subsurface layer is light brownish gray sandy loam about 1 inch thick. The subsoil extends to a depth of over 60 inches. The upper 7 inches is mixed brownish yellow and grayish brown clay, and the next 7 inches is yellowish brown sandy clay. Below this it is mainly mixed light gray and yellowish red sandy clay loam. Reaction is strongly acid in the surface layer and upper part of the subsoil and mildly to moderately alkaline in the lower part of the subsoil. Permeability is very slow.

These soils are used for range, dryfarm hay, or grain.

Representative profile of Tierra sandy loam in an area of San Andreas-Tierra complex, 9 to 15 percent slopes, eroded, on a site under annual grasses and scattered brush cover, about 280 feet west of Miguelito Road and Vandenburg Air Force Base boundary intersection and 50 feet north of boundary fence:

A11—0 to 4 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; very few medium and fine tubular pores and common very fine interstitial pores; neutral; clear smooth boundary.

A12—4 to 14 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; massive; hard, very friable, slightly sticky and slightly plastic; very few fine and many very fine roots; few fine and medium tubular pores and common very fine interstitial pores; strongly acid; abrupt smooth boundary.

A2—14 to 15 inches; light brownish gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) moist; massive; hard, very friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores and many very fine interstitial pores; strongly acid; very abrupt wavy boundary.

B21t—15 to 22 inches; brownish yellow (10YR 6/6) clay mixed with grayish brown (10YR 5/2), yellowish brown (10YR 5/6) and very dark grayish brown (10YR 3/2) moist; strong very coarse columnar structure, extremely hard, extremely firm, very sticky and very plastic; few very fine roots; common very fine tubular pores and few very fine interstitial pores; continuous thick clay films in pores and continuous moderately thick clay films on ped faces; strongly acid; clear smooth boundary.

B22t—22 to 29 inches; yellowish brown (10YR 5/6 dry and moist) light sandy clay; strong coarse subangular blocky structure; extremely hard, extremely firm,

sticky and plastic, few very fine roots, few very fine tubular and interstitial pores; many thick clay films in pores and continuous thin clay films on ped faces; clay films are brown (10YR 4/3) and dark brown (10YR 3/3) moist; mildly alkaline; clear wavy boundary

B3t—29 to 60 inches; light gray (10YR 7/1) sandy clay loam mixed with yellowish red (5YR 5/6 and 5/8), gray (10YR 6/1) mixed with yellowish red (5YR 5/6) and reddish brown (5YR 5/4) moist; weak coarse subangular blocky structure; very hard, very firm, sticky and plastic; few very fine roots; many very fine tubular pores and few very fine interstitial pores; many moderately thick clay films in pores; few thin clay films on ped faces; moderately alkaline.

The A horizon is typically grayish brown but may be gray or dark grayish brown in a hue of 10YR. It is sandy loam or fine sandy loam. Reaction is strongly acid to medium acid. Depth to the B2t horizon ranges from 4 to 20 inches. The B2t horizon is clay or sandy clay and has strong prismatic columnar or subangular blocky structure. Reaction is slightly acid to moderately alkaline. The C horizon is water-deposited sediment or softly consolidated sandstone.

TaF2—Tierra-San Andreas complex, 15 to 30 percent slopes, severely eroded. This complex consists of about 40 percent Tierra sandy loam, 25 percent San Andreas fine sandy loam; 5 percent of Gaviota and Arnold soils; 25 percent transitional soils that have sandy loam or loam surfaces and loam or clay loam subsoils that are underlain by bedrock, and areas in which little or no San Andreas soils are present. Tierra soil is on concave side slopes where water has collected and greater weathering has occurred. San Andreas soil is on ridgetops and convex side slopes. Numerous deep gullies have formed on most concave areas and several inches of surface soil has been removed by erosion from most of the remaining areas.

Tierra soil has a profile similar to the one described as representative of the series, but it averages 6 to 14 inches shallower to the clay subsoil. In many areas all of the surface layer and part of the subsoil has been eroded away. Runoff is very rapid, and the hazard of erosion is very high. Available water capacity is 1.5 to 4 inches. Effective rooting depth is 4 to 20 inches.

San Andreas soil has a profile similar to the one described as representative of the series, but it averages 6 to 12 inches shallower to bedrock because of erosion. Some areas are bare to bedrock or have only a few inches of soil remaining. Runoff is very rapid, and the hazard of erosion is very high. Available water capacity is 3.5 to 5 inches. Effective rooting depth is 21 to 30 inches.

This complex is used for range. Capability unit VIIe-1(15); Tierra soil is in Claypan range site, San Andreas soil is in Loamy range site.

Todos Series

The Todos series consists of well drained soils on uplands. The soils formed in material weathered from sandstone and shale bedrock. Slope ranges from 9 to 50 percent. Elevation is 200 to 1,400 feet. Vegetation is annual grasses, forbs, and scattered oaks; chaparral brush is on some steeper slopes. Average annual precipitation is 17 to 22 inches, mean annual air temperature is about 60° to 61° F., and the frost free season is 300 to 330 days.

In a representative profile the surface layer is dark reddish brown clay loam about 18 inches thick. The subsoil is dusky red and dark reddish brown clay about 26 inches thick. The substratum is reddish brown highly fractured soft shale. Reaction is slightly acid in the surface layer and neutral in the subsoil. Lime is present in seams in the substratum.

Permeability is slow.

These soils are used for watershed and range, and soils of this series that have lesser slopes are used for avocados, lemons, and urban development.

Representative profile of Todos clay loam, 15 to 30 percent slopes, eroded, previously under chaparral-type vegetation, on a site that is now being cleared for a new housing tract, Winchester Canyon, approximately 2,600 feet north of National Forest boundary and 100 feet east of farm road on terrace cut:

A1—0 to 5 inches, dark reddish brown (5YR 3/2) clay loam, dark reddish brown (5YR 2.5/2) moist; moderate fine granular structure; hard, friable, sticky and plastic; many very fine, fine, and medium roots; many very fine and fine tubular pores and many very fine interstitial pores; slightly acid, clear wavy boundary.

A12—5 to 18 inches; dark reddish brown (5YR 3/2) clay loam, dark reddish brown (5YR 2.5/2) moist; weak fine subangular blocky structure; very hard, firm, sticky and plastic; common very fine and many medium and coarse roots; common very fine interstitial pores and many very fine, fine, and medium tubular pores; slightly acid; clear wavy boundary.

B21t—18 to 33 inches; dusky red (2.5YR 3/2) clay, very dusky red (2.5YR 2.5/2) moist; weak fine subangular blocky structure; very hard, very firm, very sticky and very plastic; common fine, medium, and coarse roots; common very fine interstitial pores and common very fine and fine tubular pores; common thin clay films on ped faces and in pores; neutral; gradual wavy boundary.

B22t—33 to 44 inches; dark reddish brown (2.5YR 3/4) clay, dark reddish brown (2.5YR 2.5/4) moist; moderate fine subangular blocky structure; very hard, very firm, very sticky and very plastic; few fine, medium and coarse roots; common very fine interstitial pores and few very fine and fine tubular pores; common thin clay films in pores and many thin clay films on ped faces; neutral; clear wavy boundary.

Cr—44 to 56 inches; reddish brown (5YR 5/3) highly fractured soft shale, reddish

brown (5YR 4/3) moist; breaks down to clay loam; strongly effervescent with disseminated lime and lime in seams.

The A horizon typically is reddish brown or dark reddish brown and has a hue of 5YR but may be dark brown in hue of 7.5YR. It is clay loam or light clay 8 to 20 inches thick. It has weak to moderate granular or subangular blocky structure. Reaction is slightly acid to neutral. The B2t horizon is dusky red, dark reddish brown, reddish brown, or yellowish red and has a hue of 5YR or 2.5YR. It is sandy clay or clay with 35 to 48 percent clay and 6 to 10 percent more clay than the A horizon. The B2t horizon has weak or moderate subangular blocky structure. Reaction is slightly acid to moderately alkaline. The lower part of the B2t horizon may be calcareous. Depth to the Cr horizon ranges from 40 to 60 inches, except where erosion has removed some of the A and B horizons. The Cr horizon is sandstone or shale and is shattered and decomposed for several feet. In some areas all parts of the profile contain up to 5 percent hard sandstone cobbles, stones, or boulders.

TbD2—Todos clay loam, 9 to 15 percent slopes, eroded. This strongly sloping soil is in small irregular areas on low foothills. It has the profile described as representative of the series, but it is 2 to 6 inches deeper to bedrock. Gullies and rills, resulting from cultivation, are common in most areas. Included in mapping are Botella Variant, and a soil that is similar to the Todos soil on some lower slopes and areas but is more than 60 inches deep to bedrock. Also included is a small area of soil north of Santa Barbara in the vicinity of Painted Cave that has a temperature 3 to 4 degrees colder than the range defined for the Todos series.

Runoff is medium, and the hazard of erosion is moderate. Available water capacity is 6 to 10 inches. Effective rooting depth is 40 to 60 inches.

This soil is used for orchards, range, and urban development. Capability unit IVe-3(19,15); Clayey range site.

TbE2—Todos clay loam, 15 to 30 percent slopes, eroded. This moderately steep soil is on smooth low foothills. It has the profile described as representative of the series. Gullies and rills are common in most areas as a result of cultivation. Included in mapping are a few small areas of soils that are severely eroded by gullies and other small areas of soils that have slight erosion. Also included are small areas of Sespe, Lodo, and Ayar soils.

Runoff is medium and the hazard of erosion is moderate. Available water capacity is 6 to 10 inches. Effective rooting depth is 40 to 60 inches.

This soil is used for orchards, range, and urban development. Capability unit IVe-3(19,15); Clayey range site.

TdF2—Todos-Lodo complex, 30 to 50 percent slopes, eroded. This complex consists of about 60 percent Todos soils; 30 percent Lodo soils; 2 percent Rock outcrop; and 7 percent Sespe soils. Small areas of Maymen, Gaviota, and Ayar soils are on the fringes of some areas. Todos and Lodo soils are in complex and unpredictable patterns. Generally, Todos soils are on low side slopes and Lodo soils are on high side slopes and ridgetops. They are on the foothills adjacent to the very steep Lodo-Rock outcrop complex, Lodo-Sespe complex, and Maymen-Rock outcrop complex. Many areas have been or are being cultivated, and erosion is evidenced by occasional gullies in drainageways and rills on side slopes. Spots that are shallow to bedrock are on some ridges and side slopes. Some areas of soils have slight erosion.

The Todos soil has a profile similar to the one described as representative of the series, but the thickness to bedrock averages 5 to 10 inches less. Runoff is rapid, and the hazard of erosion is high. Available water capacity is 6 to 8 inches. Effective rooting depth is 40 to 60 inches.

Lodo soil has a profile similar to the one described as representative of the series. Runoff is rapid, and the hazard of erosion is high.

This complex is used for range, avocados, and lemons. Capability unit VIe-19(19,15). The Todos soil is in Clayey range site. Lodo soil is in Shallow Loamy range site.

Xerorthents, Cut and Fill Areas

XA—Xerorthents, cut and fill areas consists of mechanically manipulated soils where the original profile is no longer discernible (fig. 11). Some areas have been mechanically cut, either to supply fill material or to remove uneven high spots. Other areas have been covered by fill that contains varying amounts of rock, concrete, asphalt, and other debris. Thickness of fill material and variation of excavated areas make quality estimates and interpretations difficult.

This soil is typically well drained. Permeability, [illegible] water capacity are variable and require onsite investigation.

This land is used mainly for urban development. Onsite investigation is needed.

Zaca Series

The Zaca series consists of well drained soils on uplands. The soils formed in material weathered from calcareous shale and mudstone. Slope ranges from 9 to [illegible] percent. Elevation is 500 to 1,500 feet. Vegetation is annual grasses and forbs, a few scattered oak trees, and brush. Average precipitation is 16 to 22 inches, mean annual air temperature is 60° to 62° F., and the frost free season is 300 to 330 days.

In a representative profile the surface layer is dark gray and very dark gray clay about 39 inches thick. The next layer is gray clay about 9 inches thick. The substratum is soft marly mudstone. These soils are moderately alkaline and calcareous throughout. Permeability is slow.

These soils are used for range, urban development, and lemons.

Representative profile of Zaca clay, 9 to 15 percent slopes, eroded, on a previously cultivated site under weedy cover, mainly anise, 0.5 mile north of Summerland, about 600 feet northeast of intersection of Greenwell Road and Ortega Ridge Road, and 120 feet southeast of Rotega Ridge Road in field:

A11—0 to 2 inches; dark gray (10YR 4/1) clay, black (10YR 2/1) moist, strong medium granular structure; very hard, very fri-

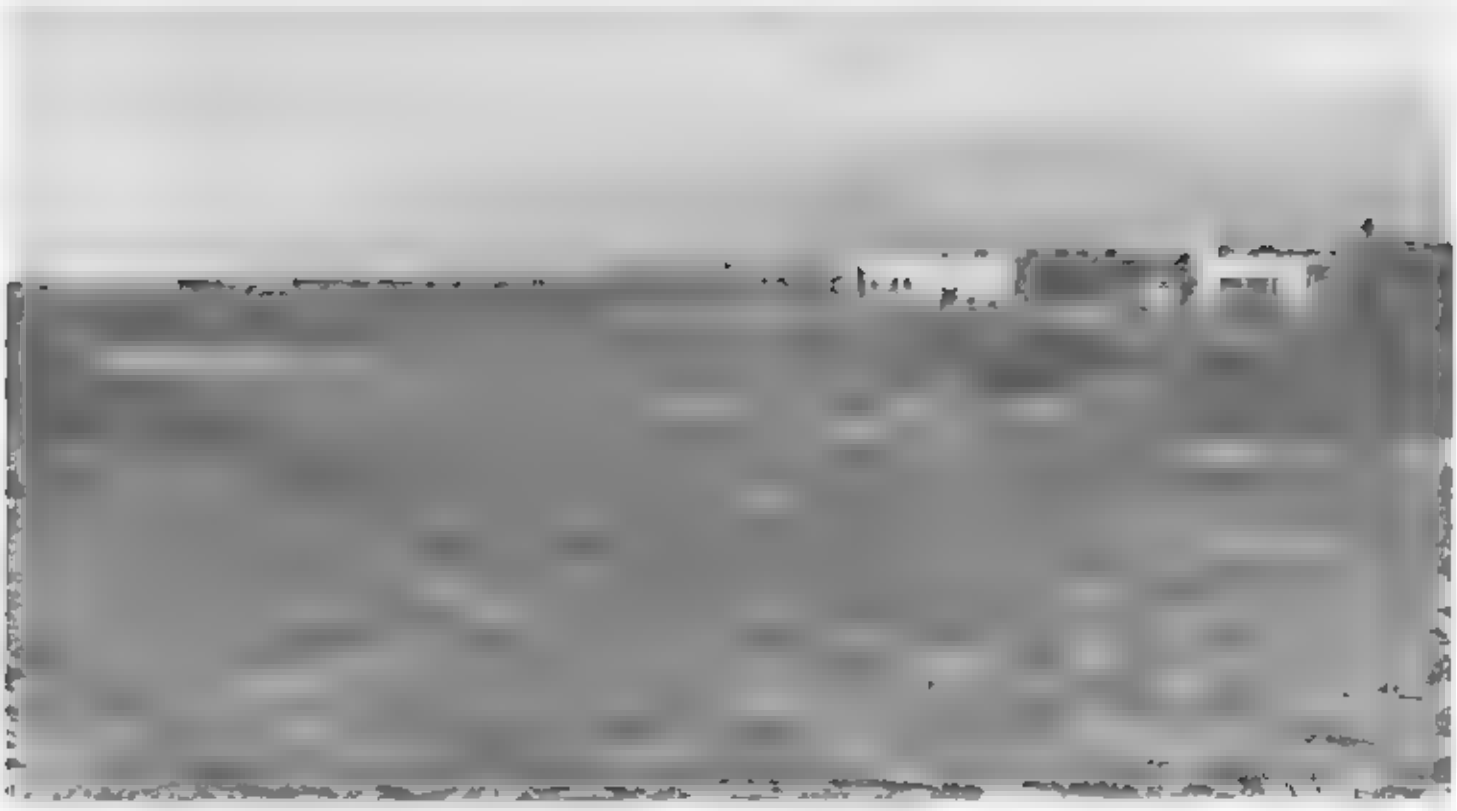

Figure 11.—The building in the background is in Xerorthents, cut and fill areas, and the orchard on the lower land in the foreground is on undisturbed soil.

able, very sticky and very plastic; many very fine roots; many very fine interstitial pores; strongly effervescent with lime disseminated and in concretions, moderately alkaline; abrupt wavy boundary.

A12—26 to 26 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine granular and weak fine subangular blocky structure; very hard, friable, very sticky and very plastic; common very fine and medium and few fine roots, many very fine interstitial pores; violently effervescent disseminated lime and concretions; moderately alkaline; abrupt wavy boundary.

A13—26 to 31 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist, moderate fine angular blocky and moderate fine granular structure; very hard, friable, very sticky and very plastic; common very fine roots; common very fine interstitial pores; common fine and medium slickensides; violently effervescent with lime in concretions, filaments and disseminated; moderately alkaline; clear wavy boundary.

A14—31 to 39 inches; dark gray (10YR 4/1) clay, black (10YR 2/1) moist; moderate fine angular blocky and moderate fine granular structure; very hard, friable, very sticky and very plastic; common very fine roots; common very fine interstitial pores; common fine and medium slickensides; violently effervescent with lime in concretions, filaments, and disseminated; moderately alkaline; clear wavy boundary.

AC—39 to 48 inches; gray (10YR 5/1) clay, very dark grayish brown (10YR 3/2) moist; moderate fine angular blocky and weak fine granular structure; very hard, firm, sticky and plastic; few very fine roots; common very fine interstitial pores; violently effervescent with lime in concretions, filaments, and disseminated; moderately alkaline; gradual wavy boundary.

Cr—48 to 60 inches; white (10YR 8/2) marly mudstone; very pale brown and light yellowish brown (10YR 7/4, 6/4) moist; massive; can be dug with handtools with difficulty.

The A horizon is dark gray or very dark gray and has a hue of 10YR. It is clay or occasionally silty clay 30 to 50 inches thick. The AC horizon ranges from light gray to dark gray and has texture of clay or silty clay. Depth to soft calcareous mudstone or shale Cr horizon ranges from 40 to 55 inches, except where erosion has removed part or all of the A horizon.

ZaD2—Zaca clay, 9 to 15 percent slopes, eroded. This strongly sloping soil is located in small irregular areas on low hills. The soil has the profile described as representative of the series.

Included with this soil in mapping are areas of soils that are 20 to 30 inches deep to underlying mudstone. Also included are small areas that have the substratum exposed and mixed with the remaining surface layer, and areas of Diablo, Ayar, and Santa Lucia soils. Most areas show evidence of rilling caused by cultivation.

Runoff is medium, and the hazard of erosion is moderate. Available water capacity is 7.5 to 10.5 inches. Effective rooting depth is 40 to 50 inches.

This soil is used for range, urban development, and orchards. Capability unit IIIe-5 (19,15); Clayey range site.

ZaE2—Zaca clay, 15 to 30 percent slopes, eroded. This moderately steep soil is in widely scattered, small irregular areas on low hills. It has a profile similar to the one described as representative of the series, but it is 4 to 10 inches shallower to the mudstone substratum. Most areas show evidence of erosion by rills and shallow gullies.

Included with this soil in mapping are areas that have little or no surface layer because of severe erosion. Also included are areas of Diablo, Todos, Ayar, and Santa Lucia soils.

Runoff is rapid, and the hazard of erosion is high. Available water capacity is 7.5 to 11.5 inches. Effective rooting depth is 40 to 55 inches.

This soil is used for range, urban development, and orchards. Capability unit IVe-5 (19,15); Clayey range site.

ZaF2—Zaca clay, 30 to 50 percent slopes, eroded. This steep soil is in small, irregularly shaped areas on low hills. It has a profile similar to the one described as representative of the series, but it is typically 6 to 14 inches shallower to bedrock. Most areas have been cultivated and show evidence of erosion by rills and shallow gullies. Included in mapping are small areas that have severe erosion and small areas with slight erosion. Also included are small areas of Diablo, Ayar, and Santa Lucia soils.

Runoff is rapid, and the hazard of erosion is high. Available water capacity is 7.5 to 10.5 inches. Effective rooting depth is 40 to 50 inches.

This soil is used for range. Capability unit VIe-1 (19,15); Clayey range site.

Use and Management of the Soils

The rapidly increasing population in the area has focused the need for efficient use of limited land resources. In this section the use of soil for farming and ranching, engineering and urban uses, and recreational development are discussed. Tables in this section have ratings of suitability or limitation for specific uses of the soils. In other tables are listed some of the soil characteristics that are used to determine the rating of a soil.

This section is intended mainly to serve as a guide in land use planning. The maps do not show all of the small variations in slope and soils because the scale of publication prohibits this detail. Onsite investigations, therefore, are still necessary when planning for specific structures or detailed uses. Interpretations apply to soil in its undisturbed state, not soil altered through grading, compaction, or other manipulation.

Parts of this section may be helpful to readers who are interested in only one use of the soil. For instance, productivity and adaptability of the soil for plant growth is discussed in the first part of this section, but this information may be of interest to those who plan urban or recreational uses of the soil. Most users of this section will find the information in the section "Descriptions of the Soils" helpful in making decisions.

In the first part of this section, use and management of the soils for production of cultivated crops and range plants is described. The capability grouping is defined, and capability units in the county are described. Major land resource areas are also explained.

In table 2 are listed estimated yields of the major crops for the soils that are normally used. Management practices necessary to produce these yields are discussed. Vegetative soil groups and range sites are described in this section.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are used and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice or some other crops that require special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, engineering, or other unrelated soil uses.

In the capability system, all kinds of soils are grouped at three levels; capability class, subclass, and unit. These are discussed in the following paragraphs.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

- Class I soils have few limitations that restrict their use.
- Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.
- Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.
- Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.
- Class V soils are not likely to erode but have other

limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife. (None in this survey area.)

Class VI soils have severe limitations that make them generally unsuited to cultivation and that limit their use largely to pasture, range, woodland, or wildlife habitat.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture, range, woodland, or wildlife habitat.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and that restrict their use to recreation, wildlife, or water supply, or to esthetic purposes.

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, clayey, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c* because the soils in class V are subject to little or no erosion. They have other limitations, however, that restrict their use largely to pasture, range, woodland, wildlife habitat, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils.

Capability units in California in classes I through IV are given Arabic numbers that suggest the chief kind of limitations responsible for placement of the soil in the capability class and subclass. For this reason, some of the units within the subclasses are not numbered consecutively, and their symbols are a partial key to some of the soil features. Except for class I, the numerals used to designate units within the classes and subclasses are:

0. Sand and gravel in the substratum limit root penetration.
1. Actual or potential erosion hazard.
2. Wetness caused by poor drainage or flooding.
3. Slow or very slow permeability in the subsoil or substratum.
4. Coarse soil texture or excessive gravel.
5. Fine textured or very fine textured surface soil.
6. Salt or alkali.
7. Cobbles, stones, or rocks.
8. Nearness to bedrock or hardpan within the effective rooting depth.
9. Low fertility or toxicity.

Soils in classes V through VIII are given the nonconnotative number 1. Soils used for range are discussed in more detail in the section "Range."

Land resource areas

Land resource areas are broad geographic areas characterized by particular patterns of soil, climate, water resources, land use, and type of farming. The continental United States is divided into 156 land resource areas.

This survey area is divided into three major land resource areas based on soil, climate, topography, vegetation, and land use. These resource areas are designated nationally as 15, 19, and 20. Resource area 15 is the Central California Coast Range; 19 is the Coastal Plain and foothills; and 20 is the Southern California mountains.

Soils in two or more resource areas can be similar and have the same capability unit symbol, but management needs differ. These management differences are the result of differences in climate, vegetation, and kinds of crops that can be grown. For this reason, capability unit symbols are followed by the numbers 15, 19, and 20, which identify the different resource areas. For example, capability units IVe-3(15) and IVe-3(19) both include moderately well drained, very slowly permeable soils that have a claypan. Both are on terraces adjacent to the ocean, but unit IVe-3(19) has water available for irrigation and IVe-3(15) does not.

Land Resource Area 15.—This land resource area includes nearly all of the survey area west of Gaviota Pass and a narrow coastal strip along the ocean east of Gaviota Pass to Tajiguas Creek. The area includes coastal plains and small valleys along the coast and hills and mountains at higher elevation. Elevation ranges from sea level to about 2,000 feet.

In summer the climate ranges from cool and foggy along the coast to warm and less foggy inland. In winter, rainfall ranges from 16 inches at some coastal points to about 25 inches in higher inland areas.

It is assumed that no significant amount of water is available for irrigation and all cropping in the area is dryland.

Soils in this area are used mainly for grazing. Grain and hay crops are grown in some valleys, on terraces, and on smoother uplands. The amount of cultivation has greatly decreased in recent years. In a significant acreage the soils are severely eroded. In the rest of the acreage, the soils are slightly to moderately eroded.

Land Resource Area 19.—This resource area consists of an east to west strip extending from Ventura County to Tajiguas Creek. It extends from the ocean to the steep brush-covered Santa Ynez Mountains. The area includes valleys, terraces, low hills, and foothills within 2 to 5 miles of the coast. Elevation ranges from sea level to about 1,400 feet.

In summer the climate is cool and foggy. The winters are mild with rainfall of about 14 inches in some coastal parts to about 20 inches in the higher inland. Frosts are light and infrequent. The frost free season is from 300 to 330 days.

It is assumed that water for irrigation is available in most areas.

Soils in this area are used for lemons, avocados,

flowers, and limited truck crops. Some areas are used for grazing, and large parts are under urban use.

Land Resource Area 20.—This area is in the Santa Ynez Mountains. It is a long narrow east to west strip from the Ventura County line to about 2 miles west of Gaviota Pass. The area includes brushy, steep to extremely steep, rough and stony mountains. Elevation ranges from about 200 feet to 4,700 feet.

[illegible] summers the climate is warm and dry. Coastal fog and low clouds, and marine breezes keep the area cooler than other interior mountains in resource area 20. Rainfall ranges from about 18 to 30 inches most of which falls in winter and in spring. The frost free season is 250 to 300 days.

It is assumed that water for irrigation is not available.

Nearly all of the area consists of Maymen soils or Rock outcrop. It is used for watershed, recreation, and limited scenic building sites.

Management by capability units

Utilization of crop residue, minimum tillage, cover crops, and fertilization are common management practices in this area. Disking or plowing under crop residue provides [illegible] and reduces soil loss from erosion. The addition of organic matter to the soil increases fertility, aeration, and moisture penetration, and maintains or improves soil structure. Minimum tillage reduces [illegible] and reduces compaction. Chemical weed control reduces the amount of tillage needed. All tillage should be done when moisture conditions are such that compaction can be kept to a minimum. Well designed access roads that minimize travel over the soil help in reducing compaction. Cover crops are effective in protecting and improving cropland and orchards during the winter rains. Cover crops [illegible] soil. Fertilization is generally needed to maintain or increase soil productivity. The kinds and amounts of fertilizers vary according to the crops and soil.

[illegible] the capability units in this survey area are described and suggestions for their use and management are given. Some soils are in more than one resource area and are in more than one capability unit. Changes of conditions, such as availability of water for irrigation, may change the capability of a mapping unit. The soil series names are mentioned in each capability unit, but this does not [illegible] particular unit. The capability designation for each soil in the survey area is given after each mapping unit description and in the "Guide to Mapping Units" [illegible] the symbol of the [illegible] is used to [illegible] sis to the class, subclass, and unit designation.

CAPABILITY CLASS I (1)

The soils in this class are very deep and well drained fine sandy loams, loams, and silty clay loams, of Agueda, Ballard, Botella, and Goleta series. They are on fans and in valleys. All of the soils formed in [illegible] from mixed sources. Slope ranges from 0 to 2 percent.

Effective rooting depth is more than 60 inches in all the soils. Permeability is moderate or moderately slow, and available water capacity is 7 to 11.5 inches. Runoff is slow to medium, and the hazard of erosion is slight.

These soils are suited to all crops adapted to the area and require only minimum conservation practices. They are used intensively for orchards, urban development, and specialty crops such as strawberries.

These soils can be irrigated by furrows, borders, or sprinklers with little risk of damage from erosion. Rate of water application and length of run vary with soil texture. In leveling, small cuts and fills cause little permanent damage.

Organic matter is rapidly depleted under intense cultivation. It can be supplied by growing a green manure crop and plowing it into the soil or by applying manure or field crop residue. Subsoiling is used periodically to break hardpans. Intensely cultivated crops require adequate application of fertilizer. Kinds and amounts of fertilizer depend on the crop requirement and soil conditions. Laboratory analysis of soils and plants are usually needed to produce maximum yield. Soil amendments, such as gypsum, are needed occasionally to improve structure and increase water intake.

CAPABILITY UNIT IIe-1 (1)

The soils in this unit are very deep and well drained fine sandy loams, clay loams, and silty clay loams of the Agueda, Ballard, Botella, and Goleta series. In places they are shaly. They are on alluvial fans and in small valleys. Slope ranges from 2 to 9 percent.

Permeability is moderate or moderately slow. Available water capacity is 7 to 11.5 inches. Runoff is medium. The hazard of erosion is moderate and is a major concern in management. The lack of irrigation water is also a management concern.

These soils are used for dryfarmed hay and grain, or for range or pasture. Contour farming and leaving stubble on or near the surface help control runoff and erosion. Gully stabilization is needed in eroded areas.

Range management is described under "Clayey Range Site" and "Loamy Range Site."

CAPABILITY UNIT IIe-2 (1)

The soils in this unit are very deep, well drained sandy loams, fine sandy loams, clay loams, and silty clay loams of the Agueda, Ballard, Botella, Botella variant, Goleta, and Elder series. They are on alluvial fans and in valleys. Slope ranges from 2 to 9 percent. In some areas the soils are shaly. Permeability is moderate to moderately slow. The available water capacity is 6 to 12 inches.

These soils are suited to and used for all crops adapted to the area. The hazard of erosion is the main limitation. Sheet erosion can be controlled by contour farming, by preserving good soil structure through the use of crop residue or green manure crops, and by not leaving the soil bare during the rainy season.

Irrigation water can be applied by furrows, borders, or sprinklers. The irrigation system needs to provide for control of water and erosion and for disposal of tail water. Deep cuts in Ballard and Botella soils can be avoided because the subsoils are clayey. Deep cuts in other soils cause no permanent damage because the soils are very deep.

CAPABILITY UNIT IIe-3(13)

Diablo clay, 2 to 9 percent slopes, is the only soil in this unit. This well drained soil is on terrace-like positions in the western part of the survey area within one or two miles of the coastline.

This soil is slowly permeable and dries out slowly. It develops wide cracks when dry. Available water capacity is 6 to 11.5 inches, and effective rooting depth is 45 to 60 inches. Runoff is medium, and hazard of erosion is slight. Water for irrigation is not available.

This soil is used for range, dryland hay, and pasture.

This soil is difficult to work and can be worked only within a narrow range of moisture content. If cultivated when dry, it is hard and compact and breaks into clods. When this soil is wet, cultivation is not only difficult but also damages soil structure.

Range management for this soil is described under "Clayey Range Site."

CAPABILITY UNIT IIe-3(29)

Diablo clay, 2 to 9 percent slopes, is the only soil in this unit. This well drained soil is on terrace-like positions within one or two miles of the coastline.

This soil is slowly permeable and dries out slowly. It develops wide cracks when dry. Available water capacity is 6 to 11.5 inches, and effective rooting depth is 45 to 60 inches. Runoff is medium, and the hazard of erosion is slight.

This soil is used for range, lemons, avocados, and urban development. Winter harvest is difficult because the soil dries slowly. It is poorly suited to avocados as the hazard of root rot is high.

Contour farming, terracing, and leaving crop residue help to build up the supply of organic matter. Deep cuts need to be avoided in leveling because the parent material is undesirable for plant growth.

This soil is difficult to work and can be worked within a narrow range of moisture content. If cultivated when dry, it is hard and compact and breaks into clods. When this soil is wet, cultivation is not only difficult but also damages soil structure.

CAPABILITY UNIT IIe-4(19)

Elder sandy loam, 0 to 2 percent slopes, is the only soil in this unit. It is in valleys adjacent to major streams. Slope is less than 2 percent. Some areas are occasionally overflowed, and channeling and deposition may occur.

Runoff is slow, and the hazard of erosion is slight. Permeability is moderate. Available water capacity is 6 to 9 inches, and effective rooting depth is more than 60 inches.

This soil is suited to all crops adapted to the area. This soil is used for lemons, avocados, row crops, and flowers. Many areas are urban or industrial.

This soil can be irrigated by furrows, borders, or sprinklers. Water needs to be applied with care because the soil is somewhat droughty. Land leveling causes little permanent damage. Protection from overflow is needed in some areas.

Organic matter is rapidly depleted under intense cultivation. It can be supplied by growing a green manure crop and returning all the residue to the soil or by applying animal or feed compost. Chiseling is needed periodically to break up tillage pans. Intensely cultivated areas require adequate application of fertilizer. Kinds and amounts of fertilizer depend on the crop requirements and soil conditions. Laboratory analysis of soils and plants are generally needed to produce maximum yields.

CAPABILITY UNIT IIe-1(33)

Botella silty clay loam, 0 to 2 percent slopes, is the only soil in this unit. It is in small valleys in the western part of the survey area.

Permeability is moderately slow. Runoff is medium and the hazard of erosion is slight. Available water capacity is 9.5 to 11.5 inches. Effective rooting depth is 60 inches or more. The lack of irrigation water is the limiting factor of this soil.

The soil is used for dryfarm hay and grain and for range and pasture. No special tillage practices are needed for erosion control. Tillage needs to be performed when the soil is not so wet that the structure is destroyed. Crop residues should be returned to the soil to supply organic matter.

Range management is described under "Clayey Range Site."

CAPABILITY UNIT IIIe-1(13)

The soils in this unit are well drained silty clay loams and shaly clay loams of the Agueda, Crow Hill, and Santa Lucia series. Slope ranges from 9 to 15 percent. Agueda soils are more than 60 inches deep, and Crow Hill and Santa Lucia soils are 24 to 40 inches deep to diatomaceous shale.

Runoff is medium, and the hazard of erosion is moderate. Permeability is moderate or moderately slow. The available water capacity is 3.5 to 11 inches.

These soils are suited to small grain or hay. Water for irrigation is not available.

Contour farming and leaving crop residue on the surface help in checking erosion and in supplying organic matter. Gully stabilization is frequently needed to permit safe cultivation on some alluvial fans.

Most previously cultivated Crow Hill areas have been returned to range.

Range management is described under "Loamy Range Site" and "Clayey Range Site."

CAPABILITY UNIT IIIe-4(19)

This unit consists of well drained clay loams, shaly clay loams, and silty clay loams of the Agueda, Botella variant, and Santa Lucia series. Slope ranges from 9 to 15 percent. Agueda and Botella Variant soils are over 60 inches deep to bedrock. Santa Lucia soils are 24 to 40 inches deep to diatomaceous shale.

Runoff is medium, and the hazard of erosion is moderate. Permeability is moderate or moderately slow. Available water capacity is 3.5 to 12 inches, depending upon effective rooting depth.

These soils are suited to close growing crops such as pasture or hay crops, truck crops, or field crops can be grown if erosion can be controlled. Only a small part of this unit is irrigated.

Sprinkler irrigation is used for land deep cuts or leveling. Runoff needs to be controlled so that water does not concentrate and form gullies. Controlling erosion is difficult during winter rains, and cover crops are needed to protect the surface. All tillage should be done across the slope or on the contour.

CAPABILITY UNIT IIIe-3 (1S)

The soils in this unit are moderately well drained fine sandy loams of the Milpitas, Positas, and Concepcion series. They are on old dissected alluvial terraces. The surface layer is fine sandy loam that is underlain by dense clay subsoil at depths of 18 to 30 inches. Water and root penetration is very slow in the subsoil. Slope ranges from 2 to 9 percent.

Available water capacity is 3 to 6 inches, and effective rooting depth is 18 to 30 inches. Moisture is released from the clayey subsoil at a very slow rate. Runoff is medium, and the hazard of erosion is moderate.

These soils are well suited to close growing crops such as pasture or hay. They are presently used for pasture, hay, and range. Water for irrigation is not available in this unit.

Contour or cross-slope farming and leaving crop residue and stubble on the surface help in checking erosion and in supplying organic matter. Diversion terraces to intercept runoff are needed in some areas. Gully stabilization is commonly needed to permit cultivation where slopes are long. Water concentrates in draws and many gullies are [illegible].

Range management is described under "Claypan Range Site."

CAPABILITY UNIT IIIe-3 (1S)

The soils in this unit are moderately well drained fine sandy loams of the Milpitas, Positas, and Concepcion series and well drained clay loams of the Todos series. They are on old dissected alluvial terraces. Slope ranges from 2 to 15 percent. The surface layer is fine sandy loam which is underlain by a dense clay subsoil at a depth of 18 to 30 inches except Todos soils which are underlain by sandstone and shale at a depth of 40 to 60 inches.

Water and root penetration is very slow or slow in the subsoil. Available water capacity is 3 to 6 inches, and effective rooting depth is 18 to 30 inches; in Todos soils effective rooting depth is 40 to 60 inches, and available water capacity is 6 to 10 inches. Moisture is released from the clay subsoil at a very slow rate. Runoff is medium, and the hazard of erosion is moderate.

These soils are better suited to close growing, shallow-rooted crops such as pasture or hay than to other crops. They are presently used for range, urban development, and lemons. Some avocados are grown.

Sprinkler irrigation can be used to keep leveling to a minimum. Runoff should be controlled so that water does not concentrate in draws and form gullies. Deep cuts need to be avoided because the subsoil is close to the surface. Overirrigation needs to be avoided because the excess water accumulates above the subsoil and damages roots. This is especially true when avocados are planted on these soils because avocado root rot is a severe hazard in soils with slow internal drainage. Breaking up the clay subsoil is most difficult because the soil seals over soon after rewetting. Erosion is a serious problem during rainy periods in winter unless the surface is protected.

Organic matter can be supplied through the use of green manure crops, crop rotation, and crop residue. These soils respond well to application of fertilizer.

CAPABILITY UNIT IVe-3 (1S)

Baywood loamy sand, 2 to 9 percent slopes, is the only soil in this unit. It is somewhat excessively drained and very deep. It consists of windblown sand from the beach that has deposited over old marine terraces along the coastline.

Permeability is rapid. Available water capacity is 4 to 6.5 inches, and the effective rooting depth is more than 60 inches. Runoff is slow, and the hazard of erosion is slight. The hazard of soil blowing is moderate to high.

This soil is used for range. It is suited for dryland grain, hay, or pasture. Water for irrigation is not available.

This soil is droughty and easily eroded by the wind. The surface should be left bare only long enough to establish a new planting; crop residue from crops or natural vegetation can be used as a surface mulch for control of soil blowing.

Range management for this soil is described under "Sandy Range Site."

CAPABILITY UNIT IIIe-1 (1S)

Baywood loamy sand, 2 to 9 percent slopes, is the only soil in this unit. It is somewhat excessively drained and very deep. It consists of wind-blown sand from the beach that has deposited over old marine terraces along the coastline. Slope ranges from 2 to 9 percent.

Permeability is rapid. Available water capacity is 4 to 6.5 inches, and the effective rooting depth is over 60 inches. Runoff is slow, and the hazard of erosion is slight. The hazard of soil blowing is moderate to high.

This soil is used for lemons, urban development, cut flowers, and field crops. Some areas are idle. The soil is suited to most irrigated crops, but only a small acreage is irrigated.

Adequate application of fertilizer and well planned irrigation are more important to this soil than to finer-textured soils. This soil requires frequent irrigations and small amounts of water per irrigation. Overirrigation wastes water and leaches nutrients. Cover crops and mulches of residue help control soil blowing. Water erosion is seldom a problem because of the high rate of infiltration. Applying barnyard manure or growing green manure crops and returning all residue increases the amount of available water held by the soil and improves fertility.

CAPABILITY UNIT IVe-3 (1S)

The soils in this unit are well drained clays of the Diablo and Zaca series on low rolling hills. They formed from soft marly mudstone. Slope ranges from 9 to 15 percent.

These soils are slowly permeable and they dry out slowly. They develop deep wide cracks when dry. Available water capacity is 6 to 11.5 inches, and the effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of erosion is moderate.

These soils are suited to and used for range, dryland hay, and pasture. Water for irrigation is not available.

Contour or cross-slope farming and leaving crop residue and stubble on the soil helps conserve soil

moisture and reduce erosion. All tillage needs to be done at the proper moisture content to avoid destroying soil structure and to avoid forming large hard clods.

Range management for this soil is described under "Clayey Range Site."

CAPABILITY UNIT IIIe-5(19)

The soils in this unit are well drained clays of the Diablo and Zaca series on low, gently rolling hills. They formed from soft marly mudstone. Slope ranges from 9 to 15 percent.

These soils are slowly permeable and they dry out slowly. They develop deep, wide cracks when dry. Available water capacity is 6 to 11.5 inches, and the effective rooting [illegible] is 36 to [illegible] inches. Runoff is medium, and the hazard of erosion is moderate.

These soils are used for range, urban development, and orchards. Winter harvest is difficult because the soils dry out slowly. They are poorly suited to avocados because of the hazard of root rot. Lemon plantings do fairly well but are usually chlorotic because the lime content in the soil and parent material is high. These soils are suited to most field crops.

The hazard of erosion is moderate in unprotected areas, [illegible] slightly to [illegible] farming [illegible] manuring [illegible] erosion. Low intensity sprinklers are best for irrigation. All tillage needs to be done at the proper moisture content to avoid puddling when wet and the formation of large clods when dry.

CAPABILITY UNIT IIIw-2(19)

The soils in this unit are deep and poorly drained fine sandy loams of the Camarillo series and Camarillo [illegible] adjacent to the coast. Slope is typically less than 1 percent. Permeability is moderate for the Camarillos series; the Camarillo variant series has a moderately permeable surface layer and slowly permeable underlying clay layer. These soils require internal drainage. Depth to water table ranges from 1 foot to 2 feet in winter to 3 to 6 feet late in summer and in fall.

Effective rooting depth is 60 inches when drained. Available water capacity is 6.5 to 10 inches. Runoff is very slow, and the hazard of erosion is slight. Water from adjacent areas flows over these soils during periods of high rainfall.

These soils are used for truck crops, lemons, and urban development, or are idle. Production is spotty and erratic. Orchard crops do poorly, and most are abandoned.

Irrigation needs to be regulated to supply enough water for crops and to avoid building up the water table. The irrigation system should have adequate provisions for disposing of excess water. To improve production, open water disposal systems may be needed. Crop rotation, use of green manure crops, and application of fertilizer help to maintain and improve [illegible].

Two small areas of this unit are in resource 15. They are used for recreation. Except for lack of water irrigation, they are similar in use and management to the areas in resource area 19.

CAPABILITY UNIT IIIs-4(19)

Metz loamy sand, the only soil in this unit, is in narrow valleys adjacent to stream channels. It formed in coarse textured, stratified, recent alluvium. During heavy rains, water from nearby channels overflows and results in channeling, scouring, and removal and deposition of soil material. Slope is less than 2 percent.

Permeability is moderately rapid. Available water capacity is 4 to 6 inches, and effective rooting depth is over 60 inches. Runoff is slow, and the hazard of erosion, especially scouring, is moderate.

This soil is suited to lemons and avocados, but with some risk of flood overflow damage. It is presently used for lemons and avocados or it is idle.

Adequate application of fertilizer and well planned [illegible] this soil. This soil needs more frequent irrigation and less water per irrigation than finer textured soils in the main parts of the valleys. Overirrigation wastes water and nutrients by rapid percolation. Sprinkler irrigation is better suited than other methods because the surface tends to be uneven from channeling after heavy storms.

CAPABILITY UNIT IIIe-3(19)

[illegible] is the only soil in this unit. It is moderately well drained soil on old alluvial terraces adjacent to the ocean. The surface layer is fine sandy loam 20 to 26 inches thick over a dense clay subsoil.

[illegible] is very slow in the subsoil layer. Available water capacity is 4 to 6 inches, and effective rooting depth is 20 to 26 inches. Moisture is released at a very slow rate from the clayey subsoil. Runoff is slow, and the hazard of erosion is slight.

This soil is better suited to such shallow-rooted crops as grasses and truck crops that are climatically adapted than to other crops. It is presently used for range and urban development. Areas previously cultivated have largely been abandoned.

[illegible] during winter rains or after heavy irrigation as it becomes saturated with water perched on the clay subsoil. During periods of wetness, roots can be damaged by prolonged saturation.

[illegible] should be applied only in [illegible] to supply the needs of crops. Cuts for land shaping need to be avoided except for minor leveling. Exposed subsoil material is difficult to bring into a reasonably productive state. Terrace edges above the ocean need protection from runoff water, as they tend to develop deep, rapidly cutting gullies or slough away under saturated conditions.

CAPABILITY UNIT IVe-1(19)

The soils in this unit are well drained to moderately well drained fine sandy loams, clay loams and silty clay loams of Crow Hill, San Andreas, Tierra, and Santa Lucia series. The very slowly permeable Tierra soil is mapped in complex with San Andreas soils and are included in this unit, although they differ in management needs. These soils are on low rolling hills. They

formed in material derived from sandstone, shale, and mudstone bedrock. Slope ranges from 9 to 30 percent.

Permeability is moderately rapid to moderately slow. The available water capacity is 3.5 to 10 inches, effective rooting depth is 22 to 50 inches. Runoff is medium to rapid, and the hazard of erosion is moderate to high.

These soils are mainly used for range. A few areas are planted to grain or grass crops for hay or pasture. Water for irrigation is not available. These soils are suitable for occasional cultivation, but not more than one year in 5. Reseeding and application of fertilizer improve the grass cover and increase feed production for grazing.

Contour or cross-slope farming and leaving crop residue from cultivated crops to be used as a surface mulch, help protect the soil from erosion. Grazing needs to be limited to protect the plant cover.

Range management for these soils is described under "Loamy Range Site," or "Claypan Range Site."

CAPABILITY UNIT IVe-1(19)

The soils in this unit are well drained to moderately well drained soils of the Linne, Santa Lucia, San Andreas, and Tierra series. The very slowly permeable Tierra soil is mapped as a complex with San Andreas soil, and included here, even though its management varies considerably. These soils are on [illegible] hills. They formed in material derived from sandstone, shale, and mudstone bedrock. Slope ranges from 9 to [illegible]. Permeability is moderately rapid to moderately slow. Permeability is very slow in the subsoil of the Tierra soils. Available water capacity is 3.5 to 10 inches. Effective rooting depth is 24 to 50 inches.

These soils are in many small, scattered areas. They are used for range, and urban development, and small areas are used for lemons and avocados. They are poorly to moderately suited to orchards depending upon the location.

Where these soils are used for orchards, winter annual crops and contour or cross-slope tillage help control soil erosion during winter rains.

CAPABILITY UNIT IVe-3(19)

This unit consists of moderately well drained soils of the Milpitas, Positas, and Concepcion series and well drained soils of the Los Osos series. The soils are on terraces. Milpitas, Positas and Concepcion soils formed in old alluvium derived mainly from well consolidated sandy marine material. Los Osos and Todos soils formed in material weathered from sandstone and shale on uplands. Slope ranges from 2 to 9 percent.

The soils on terraces have a loamy sand to fine sandy loam surface layer. The subsoil is sandy clay loam to clay subsoil at a depth of 6 to 50 inches. Water and root penetration is very slow in the clay subsoil. Available water capacity is 2 to 5 inches, and effective rooting depth is 6 to 50 inches depending upon past erosion. Moisture is released very slowly from the clay subsoil.

Los Osos and Todos soils have an effective rooting depth of 30 to 60 inches, and an available water capacity of 4.5 to 10 inches. Permeability is slow in these soils. Runoff is medium to rapid, and the hazard of water erosion is moderate to high. The hazard of soil blowing is high for the loamy sand areas where the surface is bare.

These soils are better suited to grass cover than to other uses. They are suitable for occasional cultivation for grain or hay, but not oftener than one year in 5. After cultivation, it is desirable to reseed to grass cover and use these soils for pasture. These soils are used for range and, to a limited extent, for dryland hay crops. Water for irrigation is not available in this unit.

The hazard of erosion is high when these soils are cultivated. All tillage should be done across slope or on the contour. Crop residue and native vegetation need to be used as a mulch for protection against both soil blowing and water erosion.

Range management for these soils is described under "Claypan Range Site" and "Clayey Range Site."

CAPABILITY UNIT IVe-3(19)

This unit consists of moderately well drained soils of the Milpitas, Positas, and Concepcion series and well drained soils of the Todos series. Milpitas and Positas soils are mapped as a complex. These soils are on old dissected alluvial terraces. Slope ranges from 2 to 30 percent. Milpitas, Positas and Concepcion soils have a fine sandy loam surface layer which is underlain by a dense clay subsoil at a depth of 6 to 24 inches.

Water and root penetration is very slow in the clay subsoil. Available water capacity is 2 to 5 inches, and effective rooting depth is 6 to 24 inches depending upon past erosion. Moisture is released very slowly from the clay subsoil.

Todos soils have a rooting depth of 40 to 60 inches, an available water capacity of 6 to 10 inches. Permeability is slow. Runoff is medium to rapid, and the hazard of erosion is moderate to high.

These soils are better suited to grass cover than to other uses. They are suitable for occasional cultivation, but not oftener than one year in 5. After cultivation, it is desirable to reseed to grass cover and use as irrigated pasture. They are not well suited to deep-rooted crops such as orchards because they lack depth for root formation. These soils are presently used for range and urban development and to a minor extent, for lemons and avocados.

[illegible] of these soils [illegible] cultivated. All tillage needs to be done across the slope or on the contour. Crop residue and native vegetation need to be used as a mulch for protection against erosion.

CAPABILITY UNIT IVe-4(19)

Arnold loamy sand, 9 to 15 percent slopes, the only soil in this unit, is on low hills within 1 mile to 2 miles from the coast. It is underlain by softly consolidated sand deposits at depths of 50 to 60 inches or more.

Permeability is rapid. Available water capacity is 2.5 to 5.5 inches, and effective rooting depth is 50 to 60 inches or more. Runoff is medium, and the hazard of erosion is moderate.

This soil is suitable for deep-rooted crops such as avocados and lemons if adequate provisions are made for erosion control. It is used for urban development, small family orchards, and range, or it is idle.

A well designed irrigation system is needed for light, frequent watering to prevent excessive loss of

water and nutrients by deep percolation. A perennial cover crop is needed to give protection against erosion. All tillage needs to be done on the contour.

Range management for this soil is described under "Sandy Range Site."

CAPABILITY UNIT IVe-3(13)

This unit consists of well drained clay soils of the Ayar, Diablo, and Zaca soils on low rolling hills. The soils formed from soft marly mudstone or marly shale bedrock. Depth to bedrock ranges from 40 to 60 inches. Slope ranges from 15 to 30 percent.

These soils are slowly permeable and they dry out slowly. They develop wide cracks when dry. Available water capacity is 5.5 to 11.5 inches, and effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of erosion is high.

These soils are suited to grazing and are moderately well suited to occasional dryland crops. Water for irrigation is not available. They are used mainly for range. Some areas are planted to grain or grass crops which are cut for hay or are grazed.

Cultivation, not more than one year out of 5, to harvest a hay or grain crop and establish new plant cover, is desirable when the cover is depleted or sparse. All farming needs to be done on the contour. Crop residue needs to be used as a surface mulch for protection against erosion.

Range management for these soils is described under "Clayey Range Site."

CAPABILITY UNIT IVe-3(19)

This unit consists of well drained clay soils of the Ayar, Diablo, and Zaca series on low rolling hills. The soils formed from soft marly mudstones or shale bedrock. Depth to bedrock ranges from 40 to 60 inches. Slope ranges from 15 to 30 percent.

These soils are slowly permeable and they dry out slowly. They develop wide cracks when dry. Available water capacity is 5.5 to 11.5 inches, and effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of erosion is high.

These soils are suited to irrigated pasture and fairly well suited to lemons. Lemon plantings are generally chlorotic, because the lime content is high in the soil and parent material. These soils are poorly suited to avocados, because the hazard of avocado root rot is high. They are used for range, urban development, and avocados.

Water erosion is a hazard on unprotected soil. Contour farming, growing cover crops, and leaving crop residue on the surface during the rainy season help to control erosion. A well managed irrigation program that applies water at a rate the soil will absorb reduces erosion. Sprinkler irrigation is the most successful method of water application for these soils. Tilling only when these soils have proper moisture content avoids developing large hard clods.

CAPABILITY UNIT IVe-3(19)

The soils in this unit are somewhat excessively drained to excessively drained stony sandy loams and stony coarse sandy loams of the Soboba and Cortina series. Soboba soils are in long narrow valleys that are dissected by meandering stream channels. The Cortina soils occupy alluvial fans adjacent to the major streams. Slope ranges from 2 to 9 percent. Permeability is rapid or very rapid. The available water capacity is 2 to 4 inches. The effective rooting depth is more than 60 inches. Runoff is slow to medium, and hazard of erosion is moderate to very high. Elder soils, when mapped in complex with the Soboba soils, are included in this capability unit. Elder soils, however, are on slightly higher positions in the landscape than Soboba soils and therefore receive less overflow by flooding. This sandy loam soil is moderately permeable and well drained. The available water capacity is 6 to 7 inches.

Flooding following intense storms can inundate and damage trees. Bank cutting can occur on the meandering channels, and trees may be washed out. Bank stabilization is needed to prevent this, and channels need to be kept clear. Irrigation needs to be light and frequent to prevent excessive loss in water and nutrients through deep percolation. Fertilizers need to be [illegible] by the roots of the trees. Excess fertilizer is washed away or leached below the rooting depth during winter rains.

CAPABILITY UNIT IVs-3(13)

This unit consists of moderately well drained soils of the Milpitas series. Slope ranges from 2 to 15 percent. The soils have a stony fine sandy loam surface layer and a dense stony [illegible] subsoil. Stones, cobbles, and boulders make up 20 to 30 percent, by volume, of the soil profile. Water and roots penetrate the subsoil very slowly. Depth to the stony clay subsoil is 18 to 28 inches, and the available water capacity is 4 to 6 inches. Some limited moisture is released very slowly from the subsoil. Runoff is medium to rapid, and the hazard of erosion is moderate to high.

These soils are better suited to a grass cover than other uses. Because of the stones and boulders on the surface, the use of equipment for cultivation is limited. These soils can be used for grazing or urban development.

Range management is described under "Claypan Range Site."

CAPABILITY UNIT IVs-3(19)

This unit consists of moderately well drained soils of the Milpitas series. Slope ranges from 2 to 15 percent. The soils have a stony fine sandy loam surface layer and a dense, compact, stony subsoil. Cobbles, stones, and boulders make up 20 to 30 percent, by volume, of the profile. Water and roots penetrate the subsoil very slowly. Depth to the stony clay subsoil is 18 to 28 inches, and available water capacity is 4 to 6 inches. Some limited moisture is released slowly from the subsoil. Runoff is medium, and the hazard of erosion is moderate.

These soils are better suited to grass cover than other uses. They are not well suited to deep-rooted crops such as orchards, because water builds up above the subsoil and the soils lack depth for adequate root formation. The soils are used for range and urban development.

If irrigated, water can be applied by sprinklers. Cultivation is severely limited by the stones, cobbles,

and boulders in these soils. Where they are cultivated, cultivation needs to be across the slope.

CAPABILITY UNIT IVe-[illegible](19)

Ballard Variant, stony fine sandy loam, 2 to 9 percent slopes, is the only soil in this unit. It is on broad alluvial fans. Stones and boulders are numerous on the surface and in the profile. This soil has moderate permeability. The available water capacity is 3.5 to [illegible] inches, and the effective rooting depth is more than 60 inches. Runoff is medium, and the hazard of erosion is slight.

This soil is suitable for most crops or orchards that are climatically adapted. Stones and boulders are so numerous that use of farm machinery is impeded. [illegible]

[illegible]

CAPABILITY UNIT VIe-[illegible](15, 19)

This unit consists of soils in the two resource areas that are not suitable for either dryland or for most irrigated farming but are suited to grazing. The soils are moderately well drained to somewhat excessively drained loamy sand to clay of the Arnold, Ayar, Con[illegible] Positas, San Andreas, Santa [illegible] and Zaca series. They are on terraces and uplands. Slope ranges from 9 to 50 percent. Some areas are stony or gravelly.

Permeability is rapid to very slow. Available water capacity is 1.5 to 10 inches, and the effective rooting depth is 10 inches to more than 60 inches.

These soils are suitable for range use. Some of the soils that are in Resource Area 19 are suited to avocados or lemons if erosion is controlled. Arnold soils are the best suited in this unit because they have slight hazard of avocado root rot. Lemons grow well on Arnold soils but require complex management. Lemons [illegible] but tend to be chlorotic because of the high lime content of these soils.

Management practices on these soils, when they are used for orchards, are the same as described in units IVe-1(19) and IVe-5(19). Irrigation water needs to be applied at a slower rate to prevent runoff and erosion. Soils in Resource Area 15 lack water available for irrigation and are suited only to range.

Range management for these soils is described in the range section under their assigned range sites.

CAPABILITY UNIT VIIe-1(15, 19, 20)

This unit consists of soils in the three resource areas that are suited only to range use. The soils are moderately well drained to somewhat excessively drained loamy [illegible] Argixerolls and Xererts [illegible] sile areas, and Arnold, Ayar, Capitan, Concepcion, Crow Hill, Gaviota, Linne, Lodo, Lopez, Los Osos, Maymen, Milpitas, Nacimiento, Orthents, San Andreas, Santa Lucia, Sespe, and Tierra series. These soils are on terraces and uplands. Slope ranges from 9 to 75 percent. Some areas are stony or gravelly.

Permeability is rapid to very slow. Available water capacity in these soils is 0.5 to 10 inches, and effective rooting depth is 6 to more than 60 inches. Fertility is [illegible] slight to severe.

Soils in this unit are suited to range. Forage production ranges from very low to moderate. The Lodo-Sespe complex unit is mainly covered with chaparral brush and yields little grazing for cattle. Maymen soils have fairly dense oak cover and produce little forage. Santa Lucia, Lopez, Capitan, and Crow Hill soils and Orthents are predominantly covered by brush and oak and have low forage production. Linne and Ayar soils [illegible] and are moderately productive. [illegible] brush, and grass cover and vary in production depend[illegible] Most of the soils in this unit are used for range or watershed. Some areas of the Lodo-Sespe complex and Orthents are used for avocados.

Management is very complex and erosion is difficult to control. Controlled grazing is needed to help maintain sufficient cover for maximum forage production and to control erosion.

Range management is described in the range section under their assigned range sites.

CAPABILITY UNIT VIIs-1(15, 19, 20)

This unit consists of soils in all three resource areas. The soils are well drained or somewhat excessively drained sandy loam, clay loam, or clay of the Capitan, Gaviota, Lodo, Lopez, and Montara series. Rock outcrops occur in complex with all the soils in this unit. Many areas are gravelly, shaly, stony, or cobbly. Slope ranges from 15 to 75 percent.

Permeability is moderate or moderately slow. Available water capacity is [illegible] inches. Effective rooting depth is 4 to 20 inches. Runoff is medium to very rapid, and the hazard of erosion is high to very high.

These soils are used for range, watershed, and wildlife habitat.

Management is very difficult because of the rock outcrops, shallow rooting depth, and steep slopes. Controlled grazing is needed to maintain sufficient cover for maximum forage production and to control erosion. The soils need to be protected from fires.

Forage management for these soils is described under "Shallow Loamy-Rock outcrop Complex Range Site" and "Shallow Loamy Range Site."

CAPABILITY UNIT VIIIs-1(15, 19)

This unit consists of the miscellaneous areas Dune Land, Escarpment, and Gullied Land. Dune Land is [illegible] of loose wind-deposited marine sand. It is generally sparsely vegetated and is subject to shifting by winds. Escarpment [illegible] This results in the loss of valuable land and the damage or loss of structures along the edges of the escarpments. Gullied Land [illegible] and in entrenched drainageways. It is a heavy contributor of sediment to lower lying adjacent soils.

These areas are not suited to farming. They have some value as wildlife habitat and for recreation. Vegetation that is present on these lands needs to be protected from fires. Dune Land needs fencing or special vegetation to avoid soil blowing and to protect recreational, agricultural, or urban areas.

CAPABILITY UNIT VIII–1 (15, 19, 20)

This unit consists of Beaches, Aquepts, flooded, and Riverwash. Beaches are sandy coastal strips along the ocean that are covered with water during high tide and exposed during low tide. Aquepts, flooded, are tidal marshes that are under the influence of the tide. The cover is of salt and water-tolerant plants. Some areas are covered with water during high tide and exposed during low tide. Riverwash consists of areas in major stream channels that are frequently under water during periods of runoff. In some areas vegetation is oaks and sycamore, in others it is brush. Other areas are barren.

These areas are valuable for recreation and wildlife. They are too sandy, wet, or unstable for farming. Riverwash is a source of sand and gravel.

Siltation of Aquepts, flooded, can be prevented by controlling erosion on watersheds draining into these areas.

CAPABILITY UNIT VIII–1 (18, 19, 20)

This unit consists of very steep to extremely steep areas of Maymen and Lopez soils that are mapped in complexes with Rock outcrop (fig. 12). This unit has sparse brush cover or is barren of vegetation; consequently, runoff is very rapid, especially after a fire has destroyed the cover. Runoff from the mountainous areas of this unit causes extensive damage to land below. Rocks, boulders, and debris carried by large volumes of water cause great damage to soils, crops, and structures.

These areas are too steep, too shallow, and too rocky to be used for agricultural purposes, but they have some value for wildlife and recreation. Fire protection is needed to protect vegetation and wildlife. Vegetation needs to be preserved to retard erosion and protect lower-lying areas.

Vegetative Soil Group

A vegetative soil group is a grouping of soils which have similar properties and qualities that characterize the group from a plant adaptation and use standpoint. Vegetative soil groups are primarily used for determining the plants most suitable for conservation practices [illegible] features determine each vegetative soil group. Group A is the only group in which the choice of plants is not limited by a soil feature. All other groups have one or more soils features that limit the choice of plants.

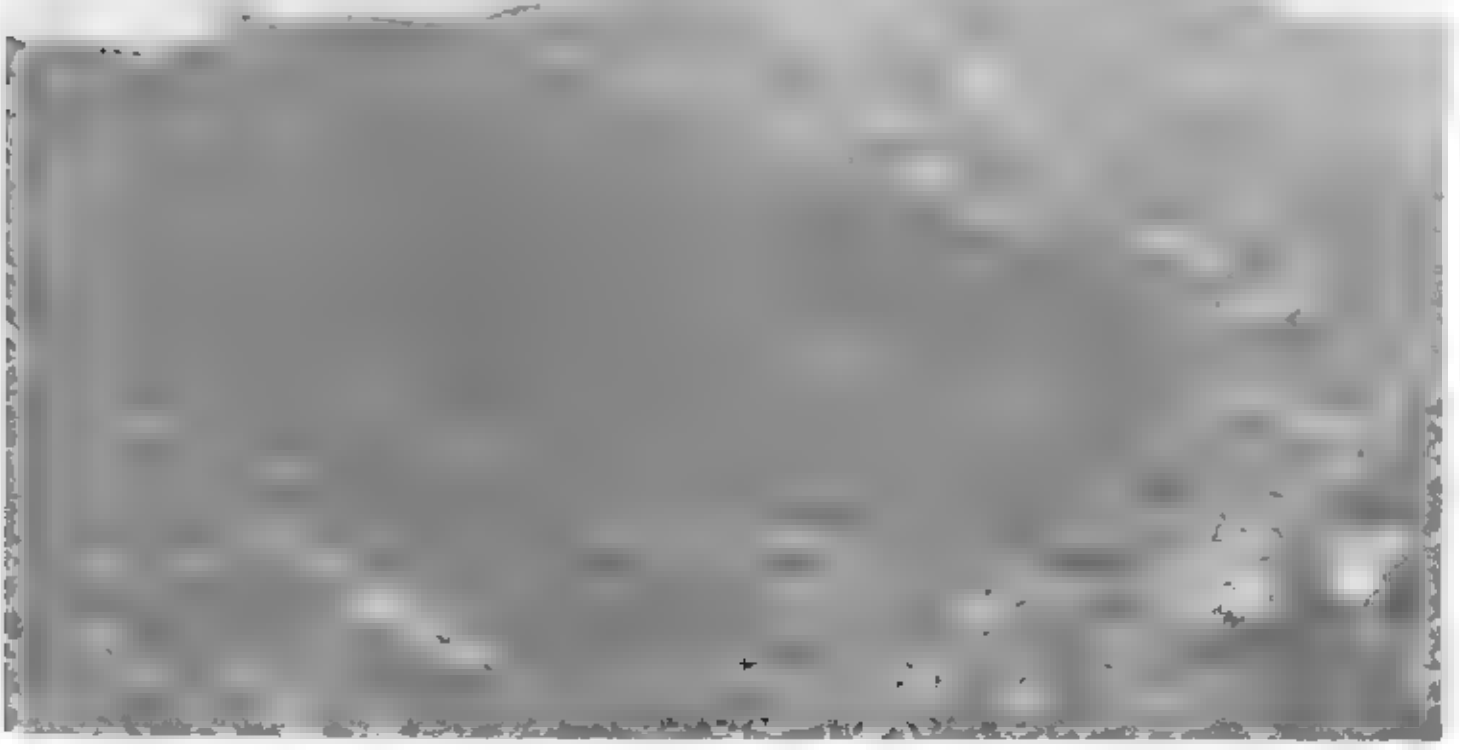

Figure 12.—An area of Maymen-Rock outcrop complex, 50 to 100 percent slopes, is in the foreground; an area of Rock outcrop-Maymen complex, 75 to 100 percent slopes, is in the background. This land is in capability class VIII.

The system is statewide and seven vegetative soil groups are recognized in this survey area. The group in which each soil has been placed is listed in the "Guide to Mapping Units." Following is a brief description of the vegetative soil groups as defined in this survey area.

Group A—Choice of plants not limited by soils. Soils are deep to very deep, moderately coarse textured to moderately fine textured, and moderately well drained or well drained. Permeability is moderately rapid to moderately slow. (Soils in this group may have slight wetness and may be slightly saline or [illegible]

Group B—Choice of plants limited by droughtiness and low fertility. Soils are coarse textured to gravel[illegible] and medium textured and excessively drained. Available water capacity is less than 5 inches in the root zone.

Group C—Choice of plants limited by fine texture. [illegible] well drained, moderately slowly through slowly permeable.

Group D—Choice of plants limited by very slowly permeable (claypan) subsoil. Soils are moderately well drained. Permeability is slow or very slow in the subsoil.

[illegible] Soils are somewhat poorly drained to very poorly drained. [illegible] their current drainage status.) Slight salinity or alkalinity, or both, may or may not be present.

[illegible]oup G—Choice of plants limited by depth. Soils [illegible] or other unfractured dense material. They are well drained.

Group J—Choice of plants depends upon onsite in[illegible]tigation. Soils include those not fitting any of abo[illegible] groups or areas in the miscellaneous nonarable category, such as Riverwash, stony, or rocky upland, etc.

Avocado Root Rot Hazard

[illegible] survey area. Avocados grown in some soils are more susceptible to root rot than are avocados grown in other soils. Internal soil drainage determines the degree of hazard. A permeable soil that drains freely after rain or irrigation has a slight hazard. A soil that has a very slowly permeable subsoil and that remains saturated for prolonged periods has a severe hazard. Soils with moderate permeability have a moderate hazard. The avocado root rot hazard for each soil is listed in the "Guide to Mapping Units."

[illegible] section "Estimated Yields." For more information, see Goodall, Hansen, and Burns (*6*).

Estimated Yields [2]

The management described in this section is that considered typical of a high level proficiency that results in the yields shown in table 2. The management practices and estimated yields are based on observations made by personnel of the Soil Conservation Service and the University of California Cooperative Extension and on the Agricultural Commissioner's annual report for Santa Barbara County.

The estimated yields and suggested management are based on current technology and plant varieties. New developments in crop breeding, control of insects and [illegible] and other management practices could eventually make obsolete some of the practices suggested and yields predicted.

The yields shown in table 2 are averages that can be expected over a period of years under a high level of management. In any given year, yields may be considerably higher or lower than the average. If little or no information was available on a yield of a given crop on a particular soil, estimates were made by comparing this soil with similar soils for which yield information was available. Yields for lemons are not given on soils with slopes in excess of 30 percent since cultural practices are too expensive on very steep slopes. Avocados can be economically planted on the steeper slopes but with greatly increased erosion hazards. Also see the separate evaluation of the avocado root rot disease hazard by soil series in "Guide to Mapping Units." It is assumed that irrigation water is available or can be made available for all arable soils.

In the paragraphs that follow, the general management needed for both crops designated in table 2 and general management for ornamental plants are described. The special management needed for each crop on several groups of soils that are suitable for this [illegible] also described. The soils in any one group are [illegible] specified crop. Each group ordinarily contai[illegible] soils of one or more capability units. In some instances, however, only some of the soils in a given capability unit are suitable for the crop. In such situations, the [illegible] that capability unit.

All requirements for plant nutrients are for the elemental form; for example, pounds per acre of the element phosphorus. The gross irrigation requirement is the total annual plant need per acre less the average effective precipitation. The irrigation requirement is calculated on the assumption that the irrigation system is 70 percent efficient.

Avocados.—The production of avocados is an expanding land use, especially because the trees can be economically grown on the steeper terrace and upland soils, where the microclimatic conditions are more favorable and where the construction of residences is more difficult.

New orchards are generally planted with 100 to 150 trees per acre; the trees are closer together on the shallower, more clayey soils and farther apart on the deep, well drained, alluvial soils. Orchards are thinned in later years. The main variety planted is [illegible] orchards is four to five years. The average orchard lasts 33 years.

The principal method of soil management is nontillage, using herbicides and mowing to control weeds. Nitrogen is applied annually, mature orchards needing

[2] By GEORGE E. GOODALL, county director and farm advisor, Cooperative Extension, University of California, Santa Barbara, California.

TABLE 2.—*Yields per acre of avocados and lemons*

(Absence of figure indicates that the crop is not suited to or is not commonly grown on the soil)

Soil	Avocados	Lemons
	Field boxes 40 lbs.	*Field boxes 80 lbs.*
Agueda silty clay loam, 0 to 2 percent slopes	320	800
Agueda silty clay loam, 2 to 9 percent slopes	320	800
Agueda silty clay loam, 9 to 15 percent slopes	300	720
Agueda-Goleta complex, 2 to 9 percent slopes	320	800
Arnold loamy sand, 0 to 2 percent slopes	240	560
Arnold loamy sand, 2 to 9 percent slopes, eroded	320	400
Arnold loamy sand, 30 to 50 percent slopes, eroded	240	
Arnold loamy sand, 50 to 75 percent slopes	200	
Ayar clay, 15 to 30 percent slopes, eroded	240	480
Ayar clay, 30 to 50 percent slopes, eroded	200	
Ayar clay, 50 to 75 percent slopes	160	
Ballard loamy sand, 2 to 9 percent slopes	320	800
Ballard fine sandy loam, 2 to 9 percent slopes	320	800
Botella gravelly clay loam, 2 to 9 percent slopes	320	640
Botella loamy sand, 2 to 9 percent slopes	320	560
Botella silty clay loam, 0 to 2 percent slopes	320	800
Botella silty clay loam, 2 to 9 percent slopes	320	800
Botella shaly clay loam, 2 to 9 percent slopes	320	800
Botella variant silty clay loam, 2 to 9 percent slopes, eroded	320	800
Botella variant loamy sand, 9 to 15 percent slopes, eroded	320	720
Cieneguitas loamy sand	320	800
Concepcion fine sandy loam	320	800
Concepcion fine sandy loam, 2 to 9 percent slopes	320	800
Concepcion fine sandy loam, 2 to 9 percent slopes, eroded	320	720
Concepcion fine sandy loam, 9 to 15 percent slopes, eroded	320	480
Concepcion fine sandy loam, 15 to 30 percent slopes, eroded	320	480
Cortina stony loamy sand, 2 to 9 percent slopes	320	720
Diablo clay, 2 to 9 percent slopes	320	640
Diablo clay, 9 to 15 percent slopes	320	640
Diablo clay, 15 to 30 percent slopes, eroded	320	480
Diablo clay, 30 to 50 percent slopes, eroded	240	
Fluvaquentic Haplaquolls, loamy	320	800
Foster sandy loam, 2 to 9 percent slopes	320	800
Foster sandy loam, 9 to 15 percent slopes	320	720
Gaviota sandy loam, 30 to 50 percent slopes	240	
Gaviota-Rock outcrop complex, 30 to 75 percent slopes	240	
Gazos fine sandy loam, 2 to 9 percent slopes	320	1,000
Gazos fine sandy loam, 9 to 15 percent slopes	320	960
Gazos-Lompico complex, 2 to 9 percent slopes	320	960
Lompico sandy loam, 2 to 9 percent slopes	320	800
Lompico sandy loam, 30 to 50 percent slopes, eroded	240	
Lompico sandy loam, 50 to 75 percent slopes	200	
Los Osos sandy loam, 15 to 30 percent slopes, eroded	320	480
Los Osos sandy loam, 30 to 50 percent slopes, eroded	240	
Maymen clay, 9 to 15 percent slopes	320	
Maymen stony fine sandy loam, 30 to 75 percent slopes	240	
Metz loamy sand	320	720
Milpitas stony fine sandy loam, 2 to 9 percent slopes	320	720
Milpitas stony fine sandy loam, 9 to 15 percent slopes	320	720
Milpitas stony fine sandy loam, 15 to 30 percent slopes	320	640
Milpitas stony fine sandy loam, 30 to 50 percent slopes	240	
Milpitas and Positas soils, 30 to 75 percent slopes, eroded	240	800
Milpitas-Positas fine sandy loams, 9 to 15 percent slopes, eroded	320	640
Milpitas-Positas fine sandy loams, 15 to 30 percent slopes, eroded	320	640
Narrow strips of loamy sand, 2 to 9 percent slopes, eroded	320	
Orthents, 50 to 75 percent slopes	240	
San Andreas-Tierra complex, 9 to 15 percent slopes	320	800
San Andreas-Tierra complex, 15 to 30 percent slopes, eroded	320	560
Santa Lucia-Tierra complex, 2 to 9 percent slopes, eroded	320	640
Santa Lucia shaly clay loam, 2 to 9 percent slopes, eroded	320	640
Tierra-San Andreas complex, 30 to 50 percent slopes, eroded	240	
Zaca clay loam, 2 to 9 percent slopes	320	800
Zaca clay, 2 to 9 percent slopes, eroded	320	800
Zaca clay, 9 to 15 percent slopes, eroded	320	800
Zaca clay, 15 to 30 percent slopes, eroded	320	800
Zaca clay, 30 to 50 percent slopes, eroded	240	

from 100 to 250 pounds per acre. Many groves need foliage applications of zinc annually. Chlorotic, iron-deficient trees often appear on soils having a high-lime subsoil and need more careful irrigation and treatment with iron chelates. Chemical insect control is generally not needed since biological control is effective. Pruning is a minor practice. Thinning trees is needed every 7 to 10 years. The trees are protected from frost damage by wind machines in the colder locations; orchard heaters are added in the coldest spots.

The most serious problem is the disease called avocado root rot. This water mold, a highly infectious fungus, is more virulent when soil moisture conditions are excessively wet. Soils with any type of restriction to free drainage or optimum aeration have increased root rot hazard. See rating by soil mapping unit in "Guide to Mapping Units." Partially resistant root stocks are being developed by University of California research. Very careful irrigation practices and provisions for optimum drainage minimize the damage from the disease.

Irrigation management is most important, not only because of root rot, but also because of possible [illegible] and the relatively high cost and limited supply of local irrigation water. Most orchards are sprinkler irrigated, some new groves have a drip irrigation system installed. The majority of the sprinkler systems are permanent, plastic pipe, under tree types. Average water use is 19 acre-inches per acre in addition to the winter rainfall.

Very little mechanical equipment is needed; harvesting is mostly by hand, so steeper terrain and smaller acreages are useable. Also, high production is more dependent on favorable climatic conditions than on soils. The yields presented in table 2 are illustrative more of the ability to grow a satisfactory vegetative tree, since the local, microclimatic conditions generally have more effect on yields than do the soils on which the trees are located.

Lemons.—Lemon orchards generally are planted on the valley floors and consist of from 90 to 130 trees per acre. Groves have a 4- to 5-year nonbearing period and an overall life of 25 to 30 years.

Most orchards are operated under a nontillage soil [illegible] vegetation control by using certain chemical herbicides. Nitrogen application annually totals 200 to 300 pounds per acre. Zinc and manganese are applied by foliage sprays. Insect and mite pests are generally controlled by two oil sprays per season. A skirt spray of Bordeaux mixture is applied in the fall for brown rot prevention. Annual pruning is practiced, with many trees topped by machine to reduce expenses. Most orchards are protected from frost damage by wind machines; orchard heaters are added in coldest locations.

Irrigation is mainly by sprinklers, either dragline, under tree type or over tree, high riser type. A few newer groves use drip irrigation. The average water consumption is 19 acre-inches per acre, applied in six 3-inch runs.

Harvesting is by hand, and since the trees are everbearing along the coast, 5 to 8 picks are needed each year to select the proper size and maturity. Yields are affected by the soil conditions as presented in table 2. Figures are not shown for soils that have more than 30 percent slope, since the mechanical equipment needed and harvesting labor costs are excessive.

Flowers and nursery crops.—The third major agricultural commodity group grown in the survey area, in addition to lemons and avocados, is the ornamental crops. The principal types are carnations, chrysanthemums, roses, cymbidium orchids, daisies, baby's breath, and a wide range of foliage and nursery plants.

Growers produce flowers inside hothouses and in the field, in natural soils and in prepared soil mixes; and in naturally lighted greenhouses and in shaded or darkened structures. Most production units are located on nearly flat land, but the soil need not be of prime quality.

Management practices are very intensive, not only in labor and equipment, but in use of chemicals and environmental modification through heating and cooling [illegible] of production areas. Most farms are highly specialized and experienced. Irrigation water consumption ranges from 2 to 5 acre-feet per acre per year.

No attempt has been made to give quantity yields [illegible] because of the wide variety of plants and their minimum dependence on the natural soils.

Range[1]

About 183,000 acres or 80 percent of the survey area is either rangeland or wildland. This land has not been developed for industrial or urban uses nor is it in cultivation. It is land that has native or natural plant cover.

Of this approximately 93,000 acres, or half of the [illegible] is on the steep south slopes of the Santa Ynez Mountains. The other half is distributed throughout the survey area adjacent to and intermingled with cropland, with urban development, and with industrial land.

The above acreage does not include Gullied Land, Riverwash, Beaches, Dune Land and such wetlands (7) as tidal marshes or other poorly drained lands along the coast.

A range site supports a distinctive potential plant community, or combination of plants, that can grow on a site that has not undergone major disturbance. Soils that produce the same kind, amount, and proportion of range plants are grouped into range sites. Range sites can be interpreted directly from the soil map where the relationships between soils and vegetation have been correlated. Properties that determine the capacity of the soil to supply moisture and plant nutrients have the greatest influence on range plants and their productivity. Soil reaction, salt content, and a seasonal high water table are also important.

Total production refers to the amount of vegetation that can be expected from a well-managed range that is supporting the potential plant community. It is expressed in pounds per acre of air-dry vegetation for favorable, and unfavorable years. A favorable year is one in which the amount and distribution of precipitation and [illegible] result in growing conditions substantially better than average; an unfavorable year is one in which these conditions are well below average, generally because of low available soil moisture.

[1] By IRVIN L. SEALANDER, range conservationist, Soil Conservation Service.

Common names are listed for the grasses, forbs, and shrubs that make up most of the potential plant community on each soil. The amount that can be used as forage depends on the kinds of grazing animals and on the season when the forage is grazed. All of the vegetation produced is normally not used.

Range management requires, in addition to knowledge of the kind of soil and the potential plant community, an evaluation of the present condition of the range vegetation in relation to its potential production. Range condition is an expression of how the present plant community compares with the potential plant community on a particular kind of soil and range site. The more nearly alike the present kinds and amounts of plants and the potential plant community, the better the range condition. The usual objective in range management is to manage grazing so that plants growing on a site are about the same in kind and amount as the potential plant community for that site. Such management generally results in the maximum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential fits grazing needs, provides wildlife habitat, or provides other benefits, as well as protecting soil and water resources.

The major management concern on most of the rangeland is control of grazing so that the kinds and amounts of plants that make up the potential plant community are reestablished. Manipulating or reducing undesirable brush species and minimizing soil blowing are also important management concerns. Soil survey information and rangeland inventories, when applied, result in increased productivity of the rangeland in the area. In the following paragraphs, the range sites in the survey area are described.

CLAYEY RANGE SITE

Soils of the Agueda, Ayar, Botella, Botella Variant, Diablo, Linne, Los Osos, Nacimiento, Sespe, Todos, and Zaca series are in this site. They vary from nearly level [illegible] Slope ranges from 2 to 75 percent, but more than half is 30 to 50 percent. Elevation ranges from 20 to 2,600 feet.

The soils are clays, clay loams, and silty clay loams. They are 20 to 60 inches or more deep over shale, mudstone, sandstone, or alluvium. They are well drained. Available water capacity is 3 to 12 inches. Permeability is slow or moderately slow in the subsoil. Runoff is slow to very rapid, and the hazard of erosion is slight to high depending on the steepness of slope.

The [illegible] have scattered oak trees or shrubs. If this site is producing at potential, about 70 percent of the plant cover is wild oats, soft chess, burclover, filaree, and other preferred plants, including needlegrass and other remnant perennial grasses. Approximately 20 percent is ripgut brome, foxtail barley, and other desirable plants, and 10 percent is nitgrass, wild mustard, fiddleneck, and other undesirable plants. When the soils are moist late in spring, annual weeds may make up more than 10 percent of the plant cover.

The estimated total annual production is 2,500 pounds per acre in favorable years and 1,200 pounds per acre in unfavorable years. The estimated total annual production that livestock and wildlife can graze is 2,000 pounds per acre in favorable years and 900 pounds per acre in unfavorable years. Estimated total annual production is the total above-ground growth [illegible] due to increase in stem diameters of trees and shrubs, expressed as air-dry weight. Also excluded are all plant residues from previous production years.

Soils of this site that have slopes of 50 percent or less are well suited to seeding with adapted annual grasses and legumes. Seeding can increase yields in depleted areas two to four times. Fertilization can double the yield in years of high rainfall, but does not significantly increase yields in years of low rainfall.

Argixerolls and Xererts, landslides areas, are included in this site. Runoff is medium to rapid, and the hazard of erosion is high. Available water capacity and effective depth are variable. Potential yields are less than those of the other soils in this site.

CLAYPAN RANGE SITE

Soils of the Concepcion, Milpitas, Positas, and Tierra series are in this site. They vary from nearly level or gently sloping to strongly sloping and steep. [illegible] quarters is 9 to 15 percent. Elevation ranges from 80 to 1,600 feet.

The soils are sandy loams, fine sandy loams, and loamy sands that have a claypan subsoil. Some are stony. They are 4 to 50 inches deep over a dense clay subsoil. They formed in mixed alluvium or water and [illegible]-deposited sediment. They are moderately well [illegible]ained. Available water capacity is generally 1.5 to 6 inches. Permeability in the subsoil is very slow. Runoff is slow to very rapid. The hazard of erosion is light to very high. The soils generally are slightly acid to strongly acid and have a mildly alkaline or moderately alkaline subsoil.

This site has an open cover of grass and scattered California buckwheat and California sagebrush with occasional scattered oaks. When this site is producing at potential, about 70 percent of the plant cover is a mixture of wild oats, soft chess, filaree, and other preferred plants, including needlegrass and other remnant perennial grasses. Burclover occurs but is not as extensive as on the Clayey Range Site. Approximately 20 percent is ripgut brome, foxtail fescue, and other desirable plants. No more than 10 percent is red brome, nitgrass, California sagebrush, California buckwheat, or other undesirable plants. In some years, tarweed is abundant on poorly managed sites.

The estimated total annual production ranges from 1,300 pounds per acre in favorable years to 500 pounds per acre in unfavorable years. The estimated total [illegible] ranges from 1,000 pounds per acre in favorable years to 350 pounds per acre in unfavorable years.

All soils, except those that have slopes of more than 30 percent, are well suited to brush management and to seeding with annual grasses and legumes. These practices can increase yields in depleted areas two to four times. Application of fertilizer can double yields in years of high rainfall, but does not significantly increase yields in years of low rainfall.

LOAMY RANGE SITE

Soils of the Crow Hill, San Andreas, and Santa Lucia series are in this site. They vary from strongly sloping to steep, and occasionally are very steep. Slope ranges from 9 to 75 percent but more than half is less than 50 percent. Elevation is 100 to 1,900 feet.

The soils are fine sandy loams, silty clay loams, and shaly clay loams, sometimes stony or gravelly or with coarse shale fragments. They are 20 to 40 inches deep over soft sandstone and shale. They are well drained. Available water capacity is 2 to 8 inches. Permeability is moderately rapid to moderately slow in the subsoil. Runoff is medium to very rapid, and the hazard of erosion is moderate to very high depending on the slopes.

This site has a cover of grass and frequent patches of open to dense stands of oak (fig. 13). Scrub oak and other brush may be on eroded or severely eroded areas and on north slopes. When this site is producing at [illegible] percent [illegible] cent of the plant cover.

The estimated total annual production is 2,100 pounds per acre in favorable years and 1,000 pounds in unfavorable years. The estimated total annual production that livestock and wildlife can graze is 1,500 pounds per acre in favorable years and 700 pounds per acre in unfavorable years.

Soils of this site are well suited to seeding with adapted grasses and legumes except where slopes are too steep or the soil too stony for use of machinery.

[illegible] in depleted areas. Application of fertilizer can double yields in years of favorable rainfall, but does not significantly increase yields in years of low rainfall.

SHALLOW LOAMY RANGE SITE

Soils of the Capitan, Gaviota, Lodo, Lopez, Maymen, and Montara series are in this site. They generally are steep, but occasionally are strongly sloping or extremely steep. About nine-tenths of the slopes are steeper than 30 percent and in a few instances extend to more than 75 percent. Elevation is mostly 100 to 2,000 feet, but occasionally is as much as 4,700 feet.

The soils mostly are sandy loams, fine sandy loams, clay loams, and clays that are 4 to 20 inches deep over sandstone, shale, conglomerate, and serpentinetic rocks. [illegible] gravelly, or shaly, and in some areas they have large boulders on the surface. They are well drained to somewhat excessively drained. Permeability is moderate or moderately slow in the subsoil. Available water capacity is 0.5 to

Figure 13.—An area in the Loamy Range Site. The vegetation is grasses and oaks.

3 inches. Runoff is medium to very rapid, and the hazard of erosion is moderate to very high.

This site has a plant cover of annual grass or open brush on gentler slopes and open to dense brush on steeper slopes. At lower elevations California sagebrush, California buckwheat, and purple sage are dominant. As elevations increase, these shrubs are mixed with and replaced by ceanothus, chamise, scrub oak, manzanita, and other chaparral species.

When this site is producing at potential, about 50 percent of the plant cover is wild oats, soft chess, filaree, and other preferred plants. Also, 20 percent is red brome, wild barley, nitgrass, and other desirable and undesirable grasses and forbs, and 30 percent is shrubs.

The estimated total annual production ranges from 800 pounds per acre in favorable years to 300 pounds in unfavorable years. The estimated annual production that livestock and wildlife can graze ranges from 300 pounds per acre in favorable years to 100 pounds in unfavorable years.

SHALLOW LOAMY ROCK OUTCROP COMPLEX RANGE SITE

Soils of the Capitan, Gaviota, and Lodo series intermingled with Rock outcrop are in this site. This site is similar to the Shallow Loamy Site, but from 30 to 70 percent of the surface is Rock outcrop or large boulders. Nearly all slopes are more than 50 percent and few of the areas have slopes greater than 75 percent.

Because of the presence of Rock outcrop, the potential annual production is 30 to 70 percent less than that of the Shallow Loamy Site.

SANDY RANGE SITE

Soils of the Arnold and Baywood series are in this site. They are nearly level to steep and occasionally are very steep. Slope ranges from 2 to 75 percent; about three-fourths is less than 30 percent. Elevation is 20 to 800 feet.

The soils are well-leached loamy sands. Arnold soils are 50 to 60 inches deep over soft sandstone. Baywood soils are more than 60 inches deep over loose loamy sand and sand deposits. All are somewhat excessively drained. Permeability is rapid in the subsoil. Runoff is slow to medium on slopes of less than 30 percent and rapid on steeper slopes. The hazard of erosion is moderate to high. Available water capacity is 2.5 to 6.5 inches.

This site has an open cover of brush and a sparse to moderately dense understory of herbaceous plants. Trees and shrubs are abundant in some areas on north slopes. Brush cover is dense in some upland areas near the coast. When this site is producing at potential, approximately 50 percent of the plant cover is a mixture of soft chess, wild oats, filaree, and other preferred plants. No more than 20 percent is desirable ripgut brome or red brome, nitgrass, and other undesirable plants. Approximately 30 percent is California sagebrush, sawtooth, goldenbush, California buckwheat, and other shrubs.

The estimated total annual production ranges from 1,500 pounds per acre in favorable years to 600 pounds per acre in unfavorable years. The estimated total annual production that livestock and wildlife can graze ranges from 1,000 pounds per acre in favorable years to 300 pounds per acre in unfavorable years.

The soils of this site that have slopes of 30 percent or less are suited to brush management and seeding to annual grasses and legumes. Range seeding can double forage production on depleted areas.

Following is a list of the plants that commonly grow in the survey area:

Common name	Scientific name
Burclover	*Medicago hispida*
California buckwheat	*Eriogonum fasciculatum*
California sagebrush	*Artemisia californica*
Ceanothus	*Ceanothus* spp.
Chamise	*Adenostoma fasciculatum*
Coyote brush	*Baccharis pilularis*
Filaree	*Erodium* spp.
Foxtail barley	*Hordeum jubatum*
Fescue	*Festuca megalura*
Goldenbush	*Haplopappus* spp.
Laurel sumac	*Rhus laurina*
Lupine	*Lupinus* spp.
Manzanita	*Arctostaphylos* spp.
Needlegrass	*Stipa* spp.
Nitgrass	*Gastridium ventricosum*
Oak	*Quercus* spp.
Poison oak	*Rhus diversiloba*
Purple sage	*Salvia leucophylla*
Redshank	*Adenostoma sparsifolium*
Ripgut brome	*Bromus rigidus*
Sawtooth goldenbush	*Hazardia squarrosa*
Scrub oak	*Quercus dumosa*
Soft chess	*Bromus mollis*
Sugar bush	*Rhus ovata*
Sumac	*Rhus* spp.
Sycamore	*Platanus racemosa*
Tarweed	*Hemizonia* sp.
Tule	*Scirpus* spp.
Wild mustard	*Brassica* spp.
Wild oats	*Avena fatua*
Willow	*Salix* spp.

Engineering

This section provides information about the use of soils for building sites, sanitary facilities, construction materials, and water management. Among those who can benefit from this section are engineers, land owners, community decisionmakers and planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in tables in this section are based on test data and on the estimated data given in the section "Soil Properties." The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by the soil survey and used in determining the ratings in this section are grain-size distribution, liquid limit, plasticity index, soil reaction, depth to and hardness of bedrock within 5 or 6 feet of the surface, soil wetness characteristics, depth to a seasonal water table, slope, the hazard of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

Based on the information assembled about soil

properties, ranges of values may be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior engineering uses. As appropriate, these values may be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to—(1) select potential residential, commercial, industrial, and recreational areas; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternate routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternate sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) [illegible] gravel [illegible] for farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these do not eliminate the need for onsite investigations and testing.

The information is presented mainly in tables. Table 3 shows, for each kind of soil, ratings of the degree and kind of limitations for building site development, table 4, for sanitary facilities; and table 6, for water management. Table 5 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms in this soil survey have different meanings in soil science and in engineering; many of these terms are defined in the Glossary.

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 3. A *slight* limitation indicates that soil properties are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are used for pipelines, sewerlines, telephone and power transmission lines, base-[illegible] trenching is influenced by soil wetness caused by a high seasonal water table, the texture and consistence of soils, the tendency of soils to cave in or slough, and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is defined, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and small commercial buildings referred to in table 3 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence from setting or shear failure of the foundation do not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for [illegible], and the large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious limitation.

Local roads and streets referred to in table 3 have an all-weather surface that can carry light to medium traffic all year. They consist of subgrade of the underlying soil material; a base of gravel, crushed rock [illegible], or soil material stabilized with lime or [illegible]; and the flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The AASHTO and Unified classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones, all of which affect stability and ease of excavation, were also considered.

TABLE 3.—*Building site development*

["Shrink-swell" and some of the other terms that describe engineering soil features are defined in the Glossary. See text for definitions of slight, moderate, and severe. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets
Agueda				
AaA, AaC	Moderate: floods	Severe: floods	Severe: floods	Moderate: floods, low strength.
Aco	Moderate: floods, slope	Severe: floods	Severe: floods	Moderate: floods, low strength, slope
Aguja				
Agueda part	Moderate: floods	Severe: floods	Severe: floods	Moderate: floods, low strength
Goliad part	Moderate: floods	Severe: floods	Severe: floods	Moderate: low strength, floods
Aquerts				
Aq	Severe: wetness	Severe: wetness, floods	Severe: wetness, floods	Moderate: wetness, floods.
Aquerts				
AT	Severe: wetness, floods	Severe: wetness, floods	Severe: wetness, floods	Severe: wetness, floods
Argixerolls				
Ar				
Argixerolls part	Severe: slope	Severe: slope	Severe: slope	Severe: slope, low strength
Nueces part	Severe: slope, too clayey	Severe: slope, low strength	Severe: slope, shrink-swell, low strength	Severe: slope, shrink-swell, low strength
Arnulfo				
AuE	Severe: too sandy, cutbanks cave, slope	Moderate: slope	Severe: slope	Moderate: slope
AuF2, AuG	Severe: too sandy, cutbanks cave, slope	Severe: slope	Severe: slope	Severe: slope.
Axtell				
AxD2, AxF2, AxG	Severe: slope, too clayey	Severe: slope, low strength, shrink-swell	Severe: slope, low strength, shrink-swell	Severe: slope, low strength, shrink-swell
Balcones				
BaA	Slight	Slight	Slight	Moderate: low strength
BaC	Slight	Slight	Moderate: slope	Moderate: low strength
Balcones variant				
BB	Moderate: large stones	Slight	Moderate: slope	Moderate: low strength
Banwood				
Bc	Severe: cutbanks cave	Slight	Moderate: slope	Slight
Beaches				
BE				
Botella				
BgA	Slight	Moderate: low strength, shrink-swell	Moderate: low strength, shrink-swell	Severe: low strength
BgC	Slight	Moderate: low strength, shrink-swell	Moderate: slope, low strength, shrink-swell	Severe: low strength
BkC	Moderate: too clayey	Moderate: low strength	Moderate: slope, low strength	Severe: low strength

TABLE 3.—*Building site development*—Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets
Botella variant	Moderate: too clayey	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
BtC2	Moderate: slope, too clayey	Moderate: slope, shrink-swell, low strength.	Severe: slope	Severe: low strength.
Camarillo	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.
Camarillo variant	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods, low strength.
Capitan	Severe: slope, depth to rock, small stones.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
Capitan part	Severe: slope, depth to rock, small stones.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
Rock outcrop part.				
Concepcion CgA, CgC, CgC2	Moderate: too clayey	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
CpC2	Moderate: too clayey	Severe: shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, low strength.
CrE, CrE2	Severe: slope	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.
Cortina	Severe: floods, cutbanks cave.	Severe: floods	Severe: floods	Severe: floods
Crow Hill	Moderate: slope	Moderate: slope, low strength.	Severe: slope	Severe: low strength.
CsC2, CsE	Severe: slope	Severe: slope	Severe: slope	Severe: slope, low strength.
Diablo	Severe: too clayey	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
DsD	Severe: too clayey	Severe: shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, low strength.
DsE2, DsF2	Severe: slope, too clayey	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.
Dune land				
Elder	Moderate: floods	Severe: floods	Severe: floods	Moderate: floods.
Elder part	Moderate: floods	Severe: floods	Severe: floods	Moderate: floods.
Soboba part	Severe: cutbanks cave, floods	Severe: floods	Severe: floods	Moderate: floods
Escarpment				

TABLE 3.—*Building site development*—Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets
Gaviota				
GaF, GaG	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock
*GbC				
Gaviota part	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock
Rock outcrop part				
Goleta				
AbC, CdA	Moderate: floods	Severe: floods	Severe: floods	Moderate: low strength, floods
Gaviland				
GL				
Lompoc				
LaC, LaE2	Severe: slope	Severe: slope	Severe: slope	Severe: slope, low strength
Lodo				
Lodo part	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock, low strength
Rock outcrop part				
Lodo				
Lodo part	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock, low strength.
Shape part	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Lopez				
Lopez part	Severe: slope, depth to rock, small stones	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock
Rock outcrop part				
Lopez				
Lopez part	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock
Santa Lucia part	Severe: depth to rock, slope	Severe: slope	Severe: slope	Severe: slope
Los Osos				
LoC, LoE	Severe: slope, depth to rock, low strength	Severe: slope, rock, low strength	Severe: slope, shrink-swell, low strength	Severe: slope, low strength, shrink-swell
Los Osos				
Los Osos part	Severe: slope, depth to rock, low strength	Severe: slope, shrink-swell, low strength	Severe: slope, shrink-swell, low strength	Severe: slope, low strength, shrink-swell
Maymen part	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock
Maymen				
MaG	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock
Maymen				
Maymen part	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock
Rock outcrop part				
Metz				
Mz	Severe: floods, wetness	Severe: floods	Severe: floods	Moderate: floods

TABLE 8.—*Building site development*—Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets
Milpitas MdC	Severe: too clayey	Slight	Moderate: slope	Severe: low strength, shrink-swell
MdD	Severe: too clayey	Moderate: slope	Severe: slope	Severe: low strength, shrink-swell
MdE, MdF	Severe: slope, too clayey	Severe: slope	Severe: slope	Severe: slope, low strength, shrink-swell
MeC Milpitas part	Severe: too clayey	Slight	Moderate: slope	Severe: low strength, shrink-swell
Positas part	Severe: too clayey	Severe: shrink-swell, low strength	Severe: slope, low strength, shrink-swell	Severe: low strength, shrink-swell
Mo2 Milpitas part	Severe: too clayey	Moderate: slope	Severe: slope	Severe: low strength, shrink-swell
Positas part	Severe: too clayey	Severe: slope, low strength, shrink-swell	Severe: slope, low strength, shrink-swell	Severe: low strength, shrink-swell
MoF2, MoH2 Milpitas part	Severe: slope, too clayey	Severe: slope	Severe: slope	Severe: slope, low strength, shrink-swell
Positas part	Severe: slope, too clayey	Severe: slope, low strength, shrink-swell	Severe: slope, low strength, shrink-swell	Severe: slope, low strength, shrink-swell
Montara: Mr2	Severe: slope, too clayey	Severe: slope	Severe: slope	Severe: slope, depth to rock, low strength
Nacimiento: NaF2	Severe: slope	Severe: slope	Severe: slope	Severe: slope, low strength
NeC Nacimiento part	Severe: slope	Severe: slope	Severe: slope	Severe: slope, low strength
Landslide part				
Orthents OAG	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Pits and dumps PA				
Riverwash RA				
Rock outcrop *Rb Rock outcrop part				
Maymen part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
San Andreas *SaF2 San Andreas part	Moderate: slope, depth to rock.	Moderate: slope	Severe: slope	Moderate: slope, low strength
Tierra part	Severe: too clayey	Severe: shrink-swell	Severe: slope, shrink-swell.	Severe: shrink-swell, low strength.
*SaF2, *SaH2 San Andreas part	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Tierra part	Severe: slope, too clayey	Severe: slope, shrink-swell	Severe: slope, shrink-swell.	Severe: slope, shrink-swell, low strength

TABLE 3.—*Building site development*—Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Small commercial buildings	Local roads and streets
Sanitary landfill areas:				
SB				
Santa Lucia				
SLE2	Severe: depth to rock, slope.	Moderate: slope, depth to rock.	Severe: slope	Moderate: slope, depth to rock.
SLF2, SrE2, SuE	Severe: slope, depth to rock, shallow soil.	Severe: slope	Severe: slope	Severe: slope.
Tierra				
TaE, TaF	Severe: slope, too clayey.	Severe: slope, shrink-swell	Severe: slope, shrink-swell	Severe: slope, shrink-swell, low strength.
TbE2	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Toomes				
TcE2	Severe: too clayey.	Severe: shrink-swell	Severe: slope, shrink-swell	Severe: low strength, shrink-swell
TdE	Severe: slope, too clayey.	Severe: slope, shrink-swell	Severe: slope, shrink-swell	Severe: slope, low strength, shrink-swell
Tujunga				
Tujunga part	Severe: slope, too clayey.	Severe: slope, shrink-swell	Severe: slope, shrink-swell	Severe: slope, low strength, shrink-swell
Lodo part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock, low strength.
Xerorthents, cut and fill areas				
XA				
Zaca				
ZaC	Severe: slope, too clayey.	Severe: low strength, shrink-swell	Severe: slope, low strength, shrink-swell	Severe: slope, low strength, shrink-swell
ZaE2	Severe: slope	Severe: low strength, shrink-swell	Severe: slope, low strength, shrink-swell	Severe: slope, low strength, shrink-swell

*This mapping unit has properties and limitations that are outside the range of the series. See description of the mapping unit for composition and behavior characteristics of the whole mapping unit.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations of the soils are important in selecting sites for these facilities and in identifying limiting soil properties that must be corrected in design and installation. Also, these soil properties that deal with the ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 4 shows the degree and kind of limitations of each soil for these uses and for use of the soil as daily cover for landfills.

If the degree of soil limitation is indicated by the term *slight*, soils are favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance are required.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil between depths of 18 to 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect the absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and a shallow depth to bedrock interfere with installation. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas. Also, soil erosion and soil slippage are hazards where absorption fields are installed in sloping soils.

TABLE 4.—*Sanitary facilities*

[Some terms that describe restrictive soil features are defined in the Glossary. See text for explanations of "slight," "moderate," "good," and "fair." Absence of an entry indicates that the soil was not rated]

Soil series and map symbols	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Agueda					
AaA, AaC	Moderate: floods.	Severe: floods	Moderate: floods.	Moderate: floods.	Fair: too clayey.
AaD	Moderate: floods.	Severe: floods.	Moderate: floods.	Moderate: floods, slope.	Fair: slope, too clayey.
Alo Alto part	Moderate: floods.	Severe: floods	Moderate: floods.	Moderate: floods.	Fair: too clayey.
Goleta part	Moderate: floods.	Severe: floods	Moderate: floods.	Moderate: floods.	Good.
Aquents					
AC	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Aquepts					
Ac	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.
Argixerolls					
Argixerolls part	Severe: slope, percs slowly.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
Nacimiento part	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey.
Ar					
AcF	Moderate: slope, depth to rock.	Severe: slope, seepage.	Severe: slope, depth to rock.	Severe: seepage.	Poor: too sandy.
AgEt	Severe: slope.	Severe: slope, seepage.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: too sandy, slope.
AgF2, AgG	Severe: slope.	Severe: slope, seepage.	Severe: seepage, slope, depth to rock.	Severe: seepage, slope.	Poor: too sandy, slope.
Arnold					
AcE2	Severe: slope, percs slowly.	Severe: slope.	Severe: too clayey, depth to rock.	Severe: slope.	Poor: slope, too clayey.
AcF2, AcG	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, too clayey, depth to rock.	Severe: slope.	Poor: slope, too clayey.
Baywood					
BaA	Slight.	Moderate: seepage.	Slight.	Slight.	Good.
Baywood					
BcC	Slight.	Moderate: slope, seepage.	Slight.	Slight.	Good.
Bellevue variant					
Bv	Moderate: large stones.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: large stones.
Bowlend					
BcC	Slight.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
Botanica					
Bf					

TABLE 4.—*Sanitary facilities*—Continued

Soil series and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Bonneau					
BoA	Severe: percs slowly	Slight	Moderate: too clayey	Slight	Fair: too clayey
BoC, BoC2	Severe: percs slowly	Moderate: slope	Moderate: too clayey	Slight	Fair: too clayey
Bonneau variant					
BvA2	Severe: percs slowly	Moderate: slope	Moderate: too clayey	Slight	Fair: too clayey
BvB2	Severe: percs slowly	Severe: slope	Moderate: slope, too clayey	Moderate: slope	Fair: slope, too clayey
Cainhoy					
Ca	Severe: wetness, floods	Severe: wetness, floods	Severe: wetness, floods	Severe: wetness, floods	Poor: wetness
Cainhoy variant					
Cv	Severe: percs slowly, wetness, floods	Severe: wetness, floods	Severe: wetness, floods	Severe: wetness, floods	Poor: wetness
Capers					
CaE	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope	Poor: slope, thin layer.
CdG:					
Capers part	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope	Poor: slope, thin layer.
Rock outcrop part					
Coosaw					
CoB	Severe: percs slowly	Moderate: slope	Moderate: too clayey	Slight	Fair: too clayey.
CrA	Severe: percs slowly	Slight	Moderate: too clayey	Slight	Fair: too clayey
CrB2	Severe: percs slowly	Severe: slope	Moderate: too clayey	Moderate: slope	Fair: slope, too clayey
Dunbarton					
DuB	Severe: slope, percs slowly	Severe: slope	Moderate: slope	Severe: slope	Poor: slope.
DuC2	Severe: slope, percs slowly	Severe: slope	Severe: slope	Severe: slope	Poor: slope.
Fortress					
Fo	Severe: floods	Severe: seepage, slopes, floods	Severe: seepage, floods	Severe: seepage, floods	Poor: large stones, poor trafficability.
Grow Hall					
GhB2	Severe: percs slowly, depth to rock	Severe: slope, depth to rock	Moderate: depth to rock	Moderate: slope	Fair: slope, thin layer, too clayey
GhC2	Severe: slope, percs slowly, depth to rock	Severe: slope, depth to rock	Moderate: slope, depth to rock	Severe: slope	Poor: slope.
GsE, GsG	Severe: slope, percs slowly, depth to rock	Severe: slope, depth to rock	Severe: slope	Severe: slope	Poor: slope.
Hallsville					
HaC	Severe: percs slowly	Moderate: slope	Severe: depth to rock, too clayey	Slight	Poor: too clayey.

TABLE 4.—*Sanitary facilities*—Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Diablo Cont.					
DaD	Severe: perc slowly.	Severe: slope	Severe: depth to rock, too clayey.	Moderate: slope	Poor: too clayey
DaE2	Severe: slope, perc slowly.	Severe: slope	Severe: depth to rock, too clayey.	Severe: slope	Poor: slope, too clayey
DaF2	Severe: slope, perc slowly.	Severe: slope	Severe: slope, depth to rock, too clayey.	Severe: slope	Poor: slope, too clayey
Elder					
EbA	Moderate: perc slowly, floods.	Severe: floods	Moderate: floods	Moderate: floods	Good
Elder	Moderate: perc slowly, floods.	Severe: floods	Moderate: floods	Moderate: floods	Good
Elder					
Elder part	Moderate: perc slowly, floods.	Severe: floods	Moderate: floods	Moderate: floods	Good
Salinas part	Severe: floods	Severe: seepage, floods	Severe: seepage, floods	Severe: seepage, floods	Poor: seepage, too clayey
Escarpment					
Gaviota					
GaE	Severe: slope, depth to rock.	Severe: slope, seepage	Severe: depth to rock, seepage	Severe: slope, seepage	Poor: slope, too clayey
GaG	Severe: slope, depth to rock.	Severe: slope, seepage	Severe: slope, depth to rock, seepage	Severe: slope, seepage	Poor: slope, too clayey
Gaviota					
Gaviota part	Severe: slope, depth to rock.	Severe: slope, seepage	Severe: slope, depth to rock, seepage	Severe: slope, seepage	Poor: slope, too clayey
Rock outcrop part					
Goleta:					
GcA, GcB	Moderate: floods	Severe: floods	Moderate: floods	Moderate: floods	Good
GcC	Moderate: floods	Severe: floods	Moderate: floods	Moderate: floods	Good
Gullied land					
Lompoc					
LaE	Severe: slope, depth to rock, perc slowly.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope	Poor: slope
LaG	Severe: slope, depth to rock, perc slowly.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope	Poor: slope
Lodo					
Lodo part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope	Poor: slope, thin layer, area reclaim.
Rock outcrop part					

TABLE 4.—*Sanitary facilities*—Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary [illegible]	Area sanitary landfill	Daily cover for landfill
Lodo Cont.					
*LoG Lodo part	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: depth to rock, slope	Severe: slope	Poor: slope, large stones, area reclaim.
Scape part	Severe: slope, percs slowly, depth to rock	Severe: slope, depth to rock	Severe: slope	Severe: slope	Poor: slope.
Lopez					
Lopez part	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope	Poor: slope, small stones, thin layer.
Rock outcrop part					
*LoE2 Lopez part	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: depth to rock	Severe: slope	Poor: slope, small stones, thin layer.
Santa Ynez part	Severe: slope, depth to rock	Severe: slope, depth to rock, small stones	Severe: depth to rock	Severe: slope	Poor: slope, small stones
*LoE2 Lopez part	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope	Poor: slope, small stones, thin layer.
Santa Ynez part	Severe: slope, depth to rock	Severe: slope, depth to rock, small stones	Severe: slope, depth to rock	Severe: slope	Poor: slope, small stones
Los Osos					
[illegible]	Severe: slope, depth to rock, percs slowly	Severe: slope, depth to rock	Severe: depth to [illegible] clayey	Severe: slope	Poor: slope
[illegible]	Severe: slope, depth to rock, percs slowly	Severe: slope, depth to rock	Severe: slope, depth to rock, too clayey	Severe: slope	Poor: slope.
*LoG Los Osos part	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: slope, depth to rock, too clayey.	Severe: slope	Poor: slope.
Maymen part	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope	Poor: slope, thin layer, area reclaim.
Ma[illegible]					
Ma[illegible]	Severe: slope, depth to rock	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope	Poor: slope, thin layer, area reclaim.
[illegible]	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope	Poor: slope, thin layer, area reclaim.
[illegible]					
Maymen part	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: depth to rock	Severe: slope	Poor: slope, thin layer, area reclaim.
Rock outcrop part					

TABLE 4.—*Sanitary facilities*—Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Metz Mc	Severe: floods	Severe: seepage, floods	Severe: seepage, floods	Severe: seepage, floods	Fair: too sandy
Milpitas MaC	Severe: percs slowly	Moderate: slope	Severe: too clayey	Slight	Fair: thin layer, large stones
MaD	Severe: percs slowly	Severe: slope	Severe: too clayey	Moderate: slope	Fair: slope, large stones, thin layer
MaE	Severe: slope, percs slowly	Severe: slope	Severe: too clayey	Severe: slope	Poor: slope
Salt Sa	Severe: slope, percs slowly	Severe: slope	Severe: slope, too clayey	Severe: slope	Poor: slope
*MeC Milpitas part	Severe: percs slowly	Moderate: slope	Severe: too clayey	Slight	Fair: thin layer
Positas part	Severe: percs slowly	Moderate: slope	Moderate: too clayey	Slight	Poor: too clayey
*MeD Milpitas part	Severe: percs slowly	Severe: slope	Severe: too clayey	Moderate: slope	Fair: slope, thin layer
Positas part	Severe: percs slowly	Severe: slope	Moderate: too clayey	Moderate: slope	Poor: slope, too clayey
*MeE2 Milpitas part	Severe: slope, percs slowly	Severe: slope	Severe: too clayey	Severe: slope	Poor: slope
Positas part	Severe: slope, percs slowly	Severe: slope	Severe: slope, too clayey	Severe: slope	Poor: slope, too clayey
MeF2 Milpitas part	Severe: slope, percs slowly	Severe: slope	Severe: slope, too clayey	Severe: slope	Poor: slope
Positas part	Severe: slope, percs slowly	Severe: slope	Severe: slope	Severe: slope	Poor: slope
Montara MnD2	Severe: slope, depth to rock, percs slowly	Severe: slope, depth to rock	Severe: slope, too clayey	Severe: slope	Poor: slope, too clayey
Nacimiento NaD2	Severe: slope, depth to rock, percs slowly	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope	Poor: slope
Nacimiento: *NbG Nacimiento part	Severe: slope, depth to rock, percs slowly	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope	Poor: slope
Landslide part					
Orthents OAG	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Poor: slope
Pits and dumps: PA					
Riverwash RA					

TABLE 4.—*Sanitary facilities*—Continued

Soil series and map symbols	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Rock outcrop: Rb					
Rock outcrop part					
Maymen part	Severe: slope, depth to rock.	Severe: slope, depth to rock	Severe: slope, depth to rock	Severe: slope	Poor: slope, thin layer, area reclaim.
San Andreas: SaD2, SaE2					
San Andreas part	Severe: depth to rock	Severe: slope, seepage, depth to rock.	Severe: seepage, depth to rock.	Severe: seepage.	Fair: slope, thin layer, area reclaim.
Tierra part	Severe: percs slowly.	Severe: slope	Severe: too clayey.	Moderate: slope.	Fair: too clayey
SaF2					
San Andreas part	Severe: slope, depth to rock	Severe: slope, seepage, depth to rock	Severe: seepage, depth to rock	Severe: slope, seepage	Poor: slope.
Tierra part	Severe: slope, percs slowly	Severe: slope	Severe: too clayey	Severe: slope	Poor: slope
ScF2					
San Andreas part	Severe: slope, depth to rock	Severe: slope, seepage, depth to rock	Severe: slope, depth to rock	Severe: slope, seepage.	Poor: slope
Tierra part	Severe: slope, percs slowly	Severe: slope	Severe: slope, too clayey	Severe: slope	Poor: slope
Sanitary landfill areas: SB					
Santa Lucia: ScE2	Severe: depth to rock	Severe: slope, depth to rock, small stones	Severe: depth to rock	Moderate: slope	Poor: area reclaim, small stones
Santa Lucia: ScF2	Severe: slope, depth to rock	Severe: slope, depth to rock, small stones	Severe: depth to rock	Severe: slope	Poor: slope, small stones
ScF2, ScG	Severe: slope, depth to rock.	Severe: slope, depth to rock, small stones	Severe: slope, depth to rock	Severe: slope	Poor: slope, small stones.
Tierra: TeE2, TeF2					
Tierra part	Severe: slope, percs slowly	Severe: slope	Severe: too clayey	Severe: slope	Poor: slope.
San Andreas part	Severe: slope, depth to rock	Severe: slope, seepage, depth to rock	Severe: seepage, depth to rock	Severe: slope, seepage.	Poor: slope
Todos: TbE2	Severe: percs slowly	Severe: slope	Severe: depth to rock, too clayey	Moderate: slope.	Poor: too clayey.
TbF2	Severe: slope, percs slowly	Severe: slope	Severe: depth to rock, too clayey	Severe: slope	Poor: slope, too clayey.
TdE2, TdF2					
Todos part	Severe: slope, percs slowly	Severe: slope	Severe: slope, depth to rock, too clayey	Severe: slope	Poor: slope, too clayey
Lodo part	Severe: slope, depth to rock.	Severe: slope, depth to rock	Severe: depth to rock, slope	Severe: slope	Poor: slope, thin layer, area reclaim.

TABLE 4.—*Sanitary facilities*—Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfills	Area sanitary landfills	Daily cover for landfill
Xerorthents, cut and fill areas					
XA					
Zaca					
ZaD2	Severe: percs slowly	Severe: slope	Severe: too clayey, slope	Moderate: slope	Poor: too clayey.
ZaE2	Severe: slope, percs slowly	Severe: slope	Severe: too clayey, slope	Severe: slope	Poor: slope, too clayey
ZaF2	Severe: slope, percs slowly	Severe: slope	Severe: slope, too clayey	Severe: slope	Poor: slope, too clayey

[1] This mapping unit is made up of two or more dominant kinds of soil. See description of the mapping unit for composition and behavior characteristics of the whole mapping unit.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and as a result ground water supplies in the area may be contaminated.

Percolation tests are performed to determine the absorptive capacity of the soil and its suitability for septic tank absorption fields. These tests should be performed during the season when the water table is highest and the soil is at minimum absorptive capacity.

In many of the soils that have moderate or severe limitations for septic tank absorption fields, it may be possible to install special systems that lower the seasonal water table or to increase the size of the absorption field so that satisfactory performance is achieved.

Sewage lagoons are shallow ponds constructed to hold sewage while bacteria decompose the solid and liquid wastes. Lagoons have a nearly level flow area surrounded by cut slopes or embankments of compacted, nearly impervious soil material. They generally are designed so that depth of the sewage is 2 to 5 feet. Impervious soil at least 4 feet thick for the lagoon floor and sides is required to minimize seepage and contamination of local ground water. Soils that vary are high in organic matter and those that have stones and boulders are undesirable. Unless the soil has very slow permeability, contamination of local ground water is a hazard in areas where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce its capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the location of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soils affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste either in excavated trenches or on the surface of the soil. The waste is spread, compacted in layers and covered with thin layers of soil. Landfill areas are subject to heavy vehicular traffic. Ease of excavation, risk of polluting ground water, and trafficability affect the suitability of a soil for this purpose. The best soils have a loamy or silty texture, have moderate or slow permeability, are easy to excavate, have a seasonal water table, are free of large stones and boulders, and are not subject to flooding. In areas where the seasonal water table is high, water seeps into the trenches and causes problems in excavating and filling the trenches. Also, seepage into the refuse increases the risk of pollution of ground water. Clayey soils are likely to be sticky and difficult to spread. Sandy and gravelly soils generally have rapid permeability that might allow noxious liquids to contaminate local ground water.

Unless otherwise stated, the ratings in table 4 apply only to soil properties and features within a depth of about 6 feet. If the trench is deeper, ratings of slight or moderate may not be valid. Site investigation is needed before a site is selected.

In the area type of sanitary landfill, refuse is placed on the surface of the soil in successive layers. The limitations caused by soil texture, depth to bedrock, and stone content do not apply to this type of landfill. Soil wetness, however, may be a limitation because of difficulty in operating equipment.

Daily cover for sanitary landfills should be soil that is easy to excavate and spread over the compacted fill during both wet and dry weather. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

In addition to these features, the soils selected for final cover of landfills should be suitable for growing plants. In comparison with other horizons, the A horizon in most soils has the best workability, more organic matter, and the most potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other

TABLE 5.—*Construction materials*

[Shrink-swell and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," and "unsuited." A dash in an entry indicates that the soil was not rated.]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Agueda:				
AgA, AgC	Fair: low strength, shrink-swell	Unsuited	Unsuited	Fair: too clayey.
AgD	Fair: low strength, shrink-swell	Unsuited	Unsuited	Fair: too clayey, slope.
AbC:				
Agueda part	Fair: low strength, shrink-swell	Unsuited	Unsuited	Fair: too clayey
Goleta part	Fair: low strength	Unsuited	Unsuited	Good
Arnold:				
AnF				
Arrendo:				
AtD	Poor: wetness	Unsuited	Unsuited	Poor: wetness, excess salt
Argixeroll:				
AxE				
Argixeroll part	Poor: slope, low strength	Unsuited	Unsuited	Poor: slope.
Xerorthents part	Poor: slope, shrink-swell, low strength	Unsuited	Unsuited	Poor: slope, too clayey.
Arnold:				
AnD	Good	Fair: excess fines	Unsuited	Poor: too sandy.
AnE2	Fair: slope	Fair: excess fines	Unsuited	Poor: too sandy, slope
AnF2, AnG	Poor: slope	Fair: excess fines	Unsuited	Poor: too sandy, slope
Ayar:				
AhE2	Poor: low strength, shrink-swell	Unsuited	Unsuited	Poor: slope, too clayey
AhF2, AhG	Poor: slope, low strength, shrink-swell	Unsuited	Unsuited	Poor: slope, too clayey
Ballard:				
BaA, BaC	Fair: low strength	Fair: excess fines	Fair: excess fines	Fair: small stones.
Ballard variant:				
Bt	Fair: low strength	Poor: excess fines	Unsuited	Poor: large stones.
Baywood:				
BcC	Good	Poor: excess fines	Unsuited	Poor: too sandy
Bradshaw:				
BF				
Botella:				
BgA, BgC	Poor: low strength	Unsuited	Unsuited	Fair: too clayey
BhC	Poor: low strength	Unsuited	Unsuited	Poor: many stones.
Botella variant:				
BkC2	Poor: low strength	Unsuited	Unsuited	Fair: too clayey
BkD2	Fair: shrink-swell, low strength	Unsuited	Unsuited	Fair: slope, too clayey.
Camarillo:				
Ca	Poor: wetness	Unsuited	Unsuited	Poor: wetness
Camarillo variant:				
Cb	Poor: wetness, shrink-swell, low strength	Unsuited	Unsuited	Poor: wetness

TABLE 5.—*Construction materials*—Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Capistan				
CcF	Poor: low strength, [illegible]	Unsuited	Unsuited	Poor: slope, small stones
*CdG				
Capistan part	Poor: low strength, [illegible]	Unsuited	Unsuited	Poor: slope, small stones
Rock outcrop part				
Concepcion				
CeB	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too sandy
CgA, CgC, CgC2	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Good
CgD2	Poor: shrink-swell, low strength	Unsuited	Unsuited	Fair: slopes
CgE2	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: slope
CgF2	Poor: slope, shrink-swell, low strength.	Unsuited	Unsuited	Poor: slope
Cortina:				
ChC	Good	Poor: excess fines	Poor: excess fines	Poor: [illegible] small stones
Crow III				
CkC2	Poor: low strength, [illegible]	Unsuited	Unsuited	Fair: slope, too clayey
CkE2	Poor: low strength, [illegible]	Unsuited	Unsuited	Poor: slope
CkF, CkG	Poor: low strength, slope, thin layer	Unsuited	Unsuited	Poor: slope
Diablo:				
DaC, DaD	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: too clayey
DaE2	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Poor: slope, too clayey
DaF2	Poor: [illegible] shrink-swell, low strength	Unsuited	Unsuited	Poor: slope, too clayey
Dunelland				
DL	[illegible]	[illegible]	[illegible]	[illegible]
Elder				
EkA, EkB	Good	Poor: excess fines	Unsuited	Good
*Eb				
Elder part	Good	Poor: excess fines	Unsuited	Good
Sorrento part	Fair: large stones	Fair: excess fines	Fair: excess fines	Poor: too sandy, large stones, small stones
Escarpment				
ES	[illegible]			
Garretta				
GaA	Poor: thin layer, [illegible]	Unsuited	Unsuited	Poor: slope, area reclaim

TABLE 5.—*Construction materials*—Continued

Soil name and map symbols	Roads	Sand	Gravel	Topsoil
Gaviota: Cont.				
GaG	Poor: slope, thin layer, area reclaim.	Unsuited	Unsuited	Poor: slope, area reclaim.
*GbG:				
Gaviota part	Poor: slope, thin layer, area reclaim.	Unsuited	Unsuited	Poor: slope, area reclaim.
Rock outcrop part.				
Goleta:				
GcA, GcC, GdA	Fair: low strength	Unsuited	Unsuited	Good.
Gullied land.				
Lompoc:				
LaA	Poor: thin layer, low strength	Unsuited	Unsuited	Poor: slope.
LaC	Poor: slope, thin layer, low strength	Unsuited	Unsuited	Poor: slope.
Lodo:				
*LbG:				
Lodo part	Poor: slope, thin layer, area reclaim.	Unsuited	Unsuited	Poor: slope, thin layer, area reclaim.
Rock outcrop part.				
*LcF:				
Lodo part	Poor: slope, thin layer, area reclaim.	Unsuited	Unsuited	Poor: slope, thin layer, area reclaim.
Sespe part	Poor: slope	Unsuited	Unsuited	Poor: slope.
Lopez:				
LpD2:				
Lopez part	Poor: slope, thin layer, area reclaim.	Unsuited	Unsuited	Poor: slope, small stones, area reclaim.
Rock outcrop part.				
*LrF2:				
Lopez part	Poor: thin layer	Unsuited	Unsuited	Poor: slope, small stones, area reclaim.
Santa Lucia part	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: slope, small stones.
*LsF2:				
Lopez part	Poor: slope, thin layer, area reclaim.	Unsuited	Unsuited	Poor: slope, small stones, area reclaim.
Santa Lucia part	Poor: slope, thin layer, area reclaim.	Unsuited	Unsuited	Poor: slope, small stones.
Los Osos:				
LtF2	Poor: low strength, steep, thin layer.	Unsuited	Unsuited	Poor: slope.
LuF2	Poor: low strength, thin layer, slope.	Unsuited	Unsuited	Poor: slope.
Los Osos:				
*LvF:				
Los Osos part	Poor: low strength, thin layer, slope.	Unsuited	Unsuited	Poor: slope.
Maymen part	Poor: slope, thin layer, area reclaim.	Unsuited	Poor: excess fines	Poor: area reclaim, slope.

TABLE 5.—*Construction materials*—Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Maymen:				
MaE	Poor: thin layer, area reclaim.	Unsuited	Poor: excess fines	Poor: area reclaim, slope
MaG	Poor: slope, thin layer, area reclaim.	Unsuited	Poor: excess fines	Poor: area reclaim, slope
MbH				
Maymen part	Poor: thin layer, area reclaim.	Unsuited	Poor: excess fines	Poor: area reclaim, slope
Rock outcrop part				
Metz				
Mz	Good	Poor: excess fines	Unsuited	Poor: too sandy
Milpitas				
MdC, MdD	Poor: low strength, shrink-swell	Unsuited	Unsuited	Poor: large stones.
MdE, MdF	Poor: low strength, shrink-swell	Unsuited	Unsuited	Poor: large stones, slope
MeC:				
Milpitas part	Poor: low strength, shrink-swell	Unsuited	Unsuited	Good
Positas part	Poor: low strength	Unsuited	Unsuited	Poor: large stones
MeD2				
Milpitas part	Poor: low strength, shrink-swell	Unsuited	Unsuited	Poor: slope
Positas part	Poor: low strength	Poor: excess fines	Unsuited	Poor: slope, small stones
MeC2				
Milpitas part	Poor: slope, low strength, shrink-swell.	Unsuited	Unsuited	Poor: slope
Positas part	Poor: low strength	Poor: excess fines	Unsuited	Poor: slope
Milpitas				
MeE2				
Milpitas part	Poor: slope, low strength, shrink-swell	Unsuited	Unsuited	Poor: slope
Positas part	Poor: slope, low strength	Poor: excess fines	Unsuited	Poor: slope
Montara				
MgF2	Poor: slope, thin layer, low strength	Unsuited	Unsuited	Poor: slope, too clayey,
Naumiento				
NaC2	Poor: slope, low strength	Unsuited	Unsuited	Poor: slope
Ns				
Naumiento part	Poor: slope, low strength	Unsuited	Unsuited	Poor: slope
Landslide part				
Orthents:				
OAG	Poor: slope	Unsuited	Unsuited	Poor: slope
Pits and dumps:				
PA				
Riverwash:				
RA				

TABLE 5.—*Construction materials*—Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Rock outcrop R				
Rock outcrop part				
Maymen part	Poor [illegible]	[illegible]	Poor [illegible] excess fines	[illegible] area reclaim
San Andreas				
San Andreas part	[illegible]	[illegible]	[illegible]	[illegible] slope
Tierra part	Poor [illegible]	[illegible]	[illegible]	[illegible]
San Andreas part	[illegible]	[illegible]	[illegible]	Poor [illegible]
Tierra part	Poor: shrink-swell, [illegible]	[illegible]	[illegible]	[illegible] slope
San Andreas: SaF2				
San Andreas part	Poor [illegible]	[illegible]	[illegible]	[illegible] slope
Tierra part	Poor: slope, shrink-[illegible]	[illegible]	[illegible]	[illegible] slope
Sedimentary rock outcrop				
[illegible]	Poor: thin layer, area reclaim.	[illegible]	[illegible]	Poor [illegible]
[illegible]	Poor: thin layer, [illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Poor: slope, thin [illegible]	Unsuited	Unsuited	Poor: slope, small [illegible]
Tierra				
Tierra part	Poor [illegible]	[illegible]	[illegible]	Poor [illegible]
San Andreas part	Poor: thin layer, area reclaim	Unsuited	[illegible]	[illegible]
Xerorthents				
[illegible]	Poor: low strength, shrink-swell	Unsuited	[illegible]	[illegible]
[illegible]	Poor: low strength, shrink-swell	Unsuited	[illegible]	Poor [illegible]
[illegible] part	Poor: slope, low strength, shrink-swell	Unsuited	[illegible]	Poor: slope
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Xerorthents, cut and [illegible]				
Zaca ZaD2	Poor: low strength, [illegible]	Unsuited	[illegible]	[illegible]

TABLE 5.—*Construction materials*—Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Zaca: Cont.				
ZaE2	Poor: low strength, shrink-swell	Unsuited	Unsuited	Poor: slope, too clayey
ZaF2	Poor: slope, low strength, shrink-swell	Unsuited	Unsuited	Poor: slope, too clayey

[illegible] map unit consists of two or more soil or miscellaneous areas. See description of the map unit for composition and behavior characteristics of the whole mapping unit.

factors to be evaluated are those that affect reclamation of the borrow areas, such as slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of road fill, sand, gravel, and topsoil is indicated in table 5 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed and described as the survey is made, generally about 6 feet.

Roadfill is soil material used in embankments for roads. The ratings reflect the ease of excavating and working the material and the expected performance of the material after it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about soil properties that determine such performance is given in the descriptions of soil series.

The ratings apply to the soil profile between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within the profile. The estimated engineering properties in table 7 provide more specific information about the nature of each horizon that can help determine its suitability for the road fill.

According to the Unified Soil Classification System, soils rated *good* have low shrink-swell potential, low potential frost action, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as high shrink-swell potential, high potential frost action, steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated [illegible] regardless of the quality of the suitable material.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 5 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Description of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 7.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to sustain the growth of plants. Also considered is the damage that would result to the area from which the topsoil is taken.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of [illegible] content of gravel, stones, or other coarse fragments, and have gentle slopes. They are low in soluble salts, which can limit plant growth. They are naturally fertile or respond to fertilization. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils, very firm clayey soils, soils with suitable layers less than 8 inches thick, soils having large amounts of gravel, stones, or soluble salt, steep soils, and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is much preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter. Consequently, careful preservation and use of material from these horizons is desirable.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 6 soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Pond reservoir areas hold water behind a dam or

TABLE 6.—*Water management*

"Seepage," and some of the other terms that describe restrictive soil features, are defined in the Glossary. Absence of an entry indicates that the soil was not rated.]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Agueda						
AgA	Seepage, slope	Low strength, piping.	Favorable	Favorable	Piping	Favorable.
AgC, AgD	Seepage, slope	Low strength, piping	Slope	Slope	Slope, piping	Slope.
Ag						
Agueda part	Seepage, slope	Low strength, piping	Slope	Slope	Slope, piping	Slope.
Goleta part	Slope, seepage	Piping, low strength	Slope	Slope	Piping, slope	Slope.
Alo						
Alo			Wetness	Wetness	Wetness	Wetness.
Ayar						
Ayar	Excess humus	Excess humus	Excess humus, excessive	Excess humus, excessive	Wetness	Wetness, excess salt
Arguxeroll						
Ar						
Arguxeroll part	Slope		Slope	Slope	Slope	Slope
Xererts part	Slope	Low strength, shrink-swell	Slope	Slope	Slope, perces slowly	Slope, perces slowly
Arl						
Arl, Ar2, Ar2						
Arl	Seepage, slope	Seepage, piping	Slope	Droughty, slope, seepage	Droughty, slope, piping	Slope, droughty, erodes easily
Ayar						
Ayar, Ayl, Ayl	Slope, depth to rock	Low strength, shrink-swell, piping	Slope, perces slowly	Slope, perces slowly	Slope, depth to rock	Slope, perces slowly
Ballard						
BaA	Seepage	Piping, seepage	Favorable	Favorable	Piping	Favorable.
BaC	Seepage	Piping, seepage	Slope	Slope	Slope, piping	Slope.
Ballard variant						
Bv	Seepage, slope	Large stones, piping	Slope	Slope, large stones	Large stones, slope	Large stones, slope.
Baywood						
Bo	Slope, seepage	Piping, seepage	Slope, earthquake damage	Slope, droughty	Piping, too sandy	Slope, droughty
Beach						
Be						
Botella						
BaA	Slope	Low strength	Favorable	Favorable	Perces slowly	Perces slowly
BoC, BoC	Slope	Low strength	Slope, perces slowly	Slope	Slope, perces slowly.	Complex slope, perces slowly.
Botella variant						
Bv, BvC2	Slope	Low strength, shrink-swell	Slope, perces slowly	Slope, perces slowly.	Slope, perces slowly.	Slope, perces slowly
Canada						
Ca	Favorable	Low strength, piping	Wetness, floods, poor outlets	Wetness, floods.	Wetness, poor outlets	Wetness.

TABLE 6.—*Water management*—Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Camarillo variant: Cb	Favorable	Piping, low strength	Wetness, percs slowly, floods	Wetness, percs slowly, floods	Wetness, percs slowly, poor outlets	Wetness, percs slowly, excess salt
Capitan: CaE	Slope, depth to rock	Low strength, thin layer	Slope	Slope	Slope, depth to rock	Slope, rooting depth
CaG: Capitan part	Slope, depth to rock	Low strength, thin layer	Slope	Slope	Slope, depth to rock	Slope, rooting depth
Rock outcrop part						
Concepcion: CbB, CbC2, CbD2, CbE2	Slope	Low strength, percs slowly	Slope, percs slowly	Slope, percs slowly	Slope, percs slowly	Slope, percs slowly
CcA	Slope	Low strength, shrink-swell	Percs slowly	Percs slowly	Percs slowly	Percs slowly
Cortina: CrB	Seepage	Piping, large stones, seepage	Slope, floods	Floods, seepage, droughty	Large stones, piping	Droughty, large stones
Crow Hill: CwB2, CwE2	Slope, depth to rock	Low strength, piping, thin layer.	Slope, percs slowly, depth to rock.	Slope, percs slowly, rooting depth.	Complex slope, depth to rock	Slope, rooting depth
Diablo: DaC2, DaD2, DaE2	Slope	Shrink-swell, low strength, seepage	Complex slope, percs slowly	Complex slope, percs slowly	Complex slope, percs slowly	Slope, percs slowly
Dune land: Du						
Elder: EcA	Seepage	Piping	Favorable	Droughty	Slope, piping	Slope.
EcB	Slope, seepage	Piping	Slope	Slope, droughty.	Slope, piping	Slope.
EfB: Elder part	Slope, seepage	Piping	Slope	Slope, droughty	Slope, piping	Slope.
Sorrento part	Seepage	Large stones, seepage, floods.	Floods	Slope, droughty, floods	Too many large stones.	Droughty, large stones.
Escarpment: ES						
Gaviota: GaE, GaG	Slope, depth to rock	Slope, thin layer, piping	Slope, depth to rock	Slope, rooting depth.	Slope, depth to rock, piping	Slope, rooting depth.
GbG: Gaviota part	Slope, depth to rock	Slope, thin layer, piping	Slope, depth to rock	Slope, rooting depth	Slope, depth to rock, piping	Slope, rooting depth
Rock outcrop part						
Goleta: GcA, GdA	Seepage	Piping, low strength.	Favorable	Favorable	Piping	Favorable.

TABLE 6.—*Water management*—Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Goleta:						
GoC, GoD	Slope, seepage	Piping, low strength.	Slope	Slope	Piping, slope	Slope
Gullied land:						
GU						
Lake:						
LaC2, LaC	Slope, depth to rock.	Low strength, compressible, thin layer.	Complex slope, depth to rock.	Complex slope, excess lime, rooting depth	Complex slope, depth to rock	Slope, rooting depth
Lodo:						
LbG:						
Lodo part	Slope, depth to rock	Thin layer, low strength	Complex slope, depth to rock	Complex slope, rooting depth	Complex slope, depth to rock	Slope, rooting depth
Rock outcrop part						
LcG:						
Lodo part	Slope, depth to rock	Thin layer, low strength	Complex slope, depth to rock	Complex slope, rooting depth	Complex slope, depth to rock	Slope, rooting depth
Sheridan part	Slope, depth to rock	Low strength, thin layer	Slope, depth to rock	Slope, rooting depth	Slope, depth to rock, low strength	Slope, depth to rock
Lopez:						
LeC:						
Lopez part	Slope, depth to rock	Thin layer	Slope, depth to rock	Slope, rooting depth	Slope, depth to rock	Slope, rooting depth.
Rock outcrop part						
LfC:						
Lopez part	Slope, depth to rock	Thin layer	Slope, depth to rock	Slope, rooting depth	Slope, depth to rock	Slope, rooting depth.
Santa Lucia part	Slope, depth to rock	Piping, thin layer	Complex slope, depth to rock	Complex slope, rooting depth	Complex slope, piping	Slope, rooting depth.
Los Osos:						
LoC2	Slope, depth to rock	Low strength, thin layer	Complex slope, depth to rock, slow permeability	Complex slope, depth to rock, slow permeability	Complex slope, depth to rock, slow permeability	Slope, depth to rock, slow permeability
LsG:						
Los Osos part	Slope, depth to rock	Low strength, thin layer	Complex slope, depth to rock, slow permeability	Complex slope, depth to rock, slow permeability	Complex slope, depth to rock, slow permeability	Slope, depth to rock, slow permeability
Millsholm part	Slope, depth to rock	Thin layer, low strength	Slope, depth to rock	Slope, rooting depth	Slope, depth to rock	Slope, rooting depth, droughty
Maymen:						
MaE2	Slope, depth to rock	Thin layer, low strength	Slope, depth to rock	Slope, rooting depth	Slope, depth to rock	Slope, rooting depth, droughty.
MeG:						
Maymen part	Slope, depth to rock	Thin layer, low strength	Slope, depth to rock	Slope, rooting depth	Slope, depth to rock	Slope, rooting depth, droughty
Rock outcrop part						

TABLE 6.—*Water management*—Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Metz	Seepage	Piping, seepage	Piping	Piping, droughty, floods.	Too clayey, piping, erodes easily	Slope, droughty
Milpitas	Slope	Shrink-swell, low strength, slope.	Percs slowly, slope.	Percs slowly, droughty, floods.	Too clayey, depth to rock.	Percs slowly, slope.
Positas	Slope	Shrink-swell, low strength, slope.	Percs slowly, slope.	Slope, droughty, floods.	Too clayey, slope.	Percs slowly, slope.
Rincon	Slope, depth to rock.	Low strength, depth to rock.	Depth to rock, slope.	Slope, rooting depth.	Slope, depth to rock.	Slope, rooting depth.
Salinas	Slope, depth to rock.	Low strength, depth to rock.	Depth to rock, percs slowly.	Complex slope, excess lime, percs slowly.	Complex slope, percs slowly, depth to rock.	Slope, percs slowly.
SaG Nacimiento part	Slope, depth to rock.	Low strength, slope.	Depth to rock, slope.	Slope, droughty, floods.	Depth to rock, slope.	Slope, percs slowly.
Landslide part						
Orthents. OAG	Slope	Large stones, erodes easily	Slope	Slope, droughty	Slope	Droughty, slope
Pits and dumps PA						
Riverwash Rw						
Rock outcrop: RO						
Mariposa	Slope, depth to rock.	Too clayey, low strength, slope.	Depth to rock, slope.	Slope, droughty, floods.	Too clayey, depth to rock.	Slope, droughty
SaA Salinas part	Slope	Low strength, slope.	Slope, percs slowly.	Slope, droughty, floods.	Slope, percs slowly.	Slope, percs slowly.
Tierra part	Slope	Low strength, slope.	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.
Sorrento silt loam SoA						

TABLE 6.—*Water management*—Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Santa Lucia: SaE2, SaF2	Slope, depth to rock	Piping, thin layer	Complex slope, depth to rock	Complex slope, depth to rock	Complex slope, depth to rock, piping	Slope, rooting depth
Tierra: TaE2						
Tierra part	Slope	Low strength, thin layer	Slope, percs slowly	Slope, percs slowly	Slope, percs slowly	Slope, percs slowly
San Andreas part	Slope, seepage, depth to rock	Low strength, thin layer	Slope, depth to rock	Low strength, slope, seepage	Slope, depth to rock	Slope, depth to rock.
Toomes: TbF	Slope, depth to rock	Low strength, slope	Percs slowly, slope	Slow intake, slope, percs slowly	Slope, percs slowly	Slope, percs slowly
TcE2						
Toomes part	Slope, depth to rock	Low strength, slope	Percs slowly, slope	Slow intake, slope, percs slowly	Slope, percs slowly	Slope, percs slowly
Lodo part	Slope, depth to rock	Thin layer, slope, low strength	Complex slope, depth to rock	Complex slope, thin layer	Complex slope, depth to rock	Slope, rooting depth
Xerorthents, cut and fill areas: XA						
Zaca: ZaE2, ZaF2	Slope	Low strength, slope, percs slowly	Percs slowly, slope	Slow intake, slope, percs slowly	Complex slope, percs slowly	Percs slowly, slope.

[1] This mapping unit is made up of two or more kinds of soil. See description of the mapping unit for composition and behavior characteristics of the whole mapping unit.

embankment. Soils suitable for this use have low seepage potential, which is determined by the permeability and depth over fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, piping, and erosion and has favorable compaction characteristics. Stone and organic matter content, soil reaction, and the amount and kinds of clay minerals present affect compaction characteristics.

Drainage is affected by such properties as permeability, texture, structure, depth to claypan or other layers that influence rate of water movement, depth to seasonal high water table, kind of water table, subsidence, susceptibility to flooding, and salinity and alkalinity.

Irrigation is affected by such features as slope, susceptibility to erosion, intake rate, permeability, texture, presence of stones, and depth of root zone. The characteristics of the soil that affect design and management are depth to the water table, amount and quality of the water available for irrigation, need for drainage, and depth to bedrock or other unfavorable material.

Terraces and diversions are embankments, or a combination of channels and ridges, constructed across a slope to intercept runoff and allow the water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity of slope and steepness, depth to bedrock or other unfavorable material, permeability, ease of establishing vegetation, and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff at nonerosive velocities to outlets. Features that affect the use of soils for waterways are slope, permeability, erosion hazard, and suitability for permanent vegetation.

Soil Properties

Extensive data about soil properties collected during the soil survey are summarized in this section. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of samples selected from representative soil profiles in the field.

When he makes soil borings during field mapping the soil scientist can identify several important soil properties. He notes the seasonal soil moisture condition, or the presence of free water and its depth in the profile. For each horizon, he notes the thickness of the soil and its color; the texture, or the amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or natural pattern of cracks and pores in the undisturbed soil; and the consistence of soil in-place under the existing soil moisture conditions. He records the root depth of each profile and determines the pH or reaction, and identifies any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to characterize key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many of the soil series are available from nearby areas.

Based on summaries of available field and laboratory data, and listed in tables in this section, are estimated ranges in engineering properties and classifications and in physical and chemical properties for each major horizon of each soil in the survey area. Also, pertinent soil and water features, engineering test data, and data obtained from laboratory analyses, both physical and chemical, are presented.

Engineering properties

Table 7 gives estimates of engineering properties and classification for the major horizons of each soil in the survey area. These estimates are presented as ranges in values most likely to exist in areas where the soil is mapped.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Information is presented for each of these contrasting horizons. Depth to the upper and lower boundaries of each horizon in a typical profile of each soil is indicated. More information about the range in depth and in properties of each horizon is given for each soil series in "Descriptions of the Soils."

Texture is described in table 7 in standard terms used by the United States Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined by USDA and are listed in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (USCS) (*2*) and the American Association of State Highway and Transportation Officials Soil Classification System (AASHTO) (*1*). In table 7 soils in the survey area are classified according to both systems.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example CL–ML.

The AASHTO system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified as one of seven basic groups ranging from A–1 through A–7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A–1 are coarse grained and low in content of fines. At the other extreme, in group A–7, are fine-grained soils. Highly organic soils are classified as A–8 on the basis of visual inspection.

When laboratory data are available, the A–1, A–2, and A–7 groups are further classified as follows: A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or more for the poorest. The AASHTO classification for soils tested in the survey area, with group index numbers in parentheses, is given in table 10. The estimated classification, without group index numbers, is given in table 7. Also in table 7 the percentage, by weight, of cobbles or the rock fragments more than 3 inches in diameter are estimated for each major horizon. These estimates are determined largely by observing volume percentage in the field and then converting it, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four standard sieves is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and plasticity index indicate the effect of water on the strength and consistency of soil. These indexes are used in both the USCS and the AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Estimates of liquid limit and plasticity index are estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

All estimates given in table 7 have been rounded to the nearest 5 percent. Thus, when the ranges of gradation and Atterberg limits extend a marginal amount across classification boundaries (1 or 2 percentage points), the classification in the marginal zone has been omitted.

Physical and chemical properties

Table 8 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depth indicated, in the representative profile of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known

TABLE 7.—*Engineering properties*

[The symbol > means more than. Absence of

Soil name and map symbol	Depth	USDA texture	Classification	
			Unified	AASHTO
	In			
Agueda:				
AaA, AaC, AaD	0–33	Silty clay loam	CL	A–6
	33–66	Clay loam	CL	A–6
AuC				
Agueda part	0–33	Silty clay loam	CL	A–6
	33–66	Clay loam	CL	A–6
Goletu part	0–40	Fine sandy loam	CL–ML, SM–SC	A–2, A–4
	40–55	Stratified loamy sand to clay loam	CL–ML, ML, SM–SC, SM	A–4
	55–72	Fine sandy loam	CL–ML, ML, SM–SC, SM	A–4
Aquents				
Ac	0–60	Variable		
Argixerolls				
AE				
Argixerolls part	0–48	Clay loam	CL	A–6, A–7
Xerorts part	0–48	Clay	CL, CH	A–7
Arnold				
AgC, AgC2, AgE2, AgG	0–58	Loamy sand	SP–SM, SM	A–1, A–2
	58	Weathered bedrock		
Azule				
AcE2, AnE2, AsG	0–40	Clay	CH	A–7
	40	Weathered bedrock		
Ballard				
BaA, BaC	0–31	Fine sandy loam	CL–ML, SM–SC	A–4
	31–42	Stony clay loam	SM, SC, GM, GC	A–4, A–2
	42–60	Very stony clay loam	GM, GP, GP–GM	A–1
Ballard variant				
BbC	0–24	Stony fine sandy loam	SM–SC, CL–ML	A–2, A–4
	24–35	Very stony loam	SM–SC, CL–ML	A–2, A–4
	35–60	Very stony loamy sand	SM	A–2, A–1
Baywood				
Bc	0–62	Loamy sand	SM	A–2
Beach				
Be				
Botella				
BgA, BgC	0–5	Silty clay loam	CL	A–6, A–7
	5–72	Silty clay loam	CL	A–6, A–7
BkC	0–5	Shaly clay loam	CL, GC	A–6, A–7
	5–72	Silty clay loam	CL	A–6, A–7
Botella variant,				
BnC2, BnD2	0–7	Silty clay loam	CL	A–6
	7–73	Clay loam	CL	A–6, A–7
	73–80	Clay loam	CL	A–6, A–7
Camarillo				
Ca	0–19	Fine sandy loam	SM, ML	A–2, A–4
	19–57	Loam, sandy loam, sandy clay loam, loamy sand	CL–ML, SM, SC	A–4

and classifications

an entry indicates that data were not estimated]

Fragments > 3 inches	Percentage passing sieve number—				Liquid limit	Plasticity index
	4	10	40	200		
Pct					Pct	
0	100	100	90–100	85–95	25–40	10–20
0	100	100	70–90	60–70	20–30	10–15
0	100	100	90–100	85–95	25–40	10–20
0	100	100	70–90	60–70	20–30	10–15
0	100	100	60–90	30–[illegible]	20–30	5–10
0	100	100	50–100	35–55	15–30	NP–10
0	**100**	**100**	**70–85**	**40–55**	**15–25**	**NP–10**
0–20	80–100	80–100	75–100	50–95	30–50	10–25
0	90	100	95–100	90–100	40–60	20–30
0	90–100	85–100	40–80	5–30		NP
0	100	95–100	90–[illegible]	85–[illegible]	50–[illegible]	25–45
0	80–100	75–[illegible]	65–95	35–75	25–30	5–10
15–30	55–90	[illegible]–75	40–65	30–[illegible]	20–[illegible]	5–10
80–90	45–55	40–50	5–35	0–20	0–[illegible]	NP–5
20–30	80–100	80–90	45–85	25–[illegible]	20–30	5–10
30–[illegible]	90–100	85–90	5–85	30–70	20–[illegible]	5–10
30–50	85–90	70–80	30–55	10–30	10–25	NP–5
0	100	100	50–90	15–30		NP
0	80–100	75–100	70–95	60–80	30–45	15–25
0	90–100	85–100	70–95	60–80	35–45	15–25
0	65–80	60–75	55–70	40–60	30–45	15–25
0	90–100	80–100	70–95	60–80	35–45	15–25
0	**100**	**100**	**85–100**	**60–80**	**25–40**	**10–20**
0	**100**	**100**	**90–100**	**70–95**	**30–50**	**15–35**
0	**100**	**100**	**90–100**	**70–80**	**30–45**	**10–20**
0	95–100	95–100	60–70	30–55	10–20	NP–5
0	95–100	95–100	85–95	35–65	15–25	5–10

TABLE 7.—*Engineering properties*

Soil name and map symbol	Depth	USDA texture	Classification	
			Unified	AASHTO
	In			
Camarillo variant:				
	0–7	Fine sandy loam	SM, SC, SM-ML, CL-ML	A-2, A-4
	7–35	Stratified loamy sand to clay loam	SM, SM-SC	A-2, A-4
	35–72	Clay	CL, CH	A-7
Capitan:				
CaF	0–9	Gravelly clay loam	SC, CL	A-6, A-7
	9–17	Very gravelly clay loam	GC, SC	A-6, A-7
	17	Weathered bedrock		
CdF:				
Capitan part	0–9	Gravelly clay loam	SC, CL	A-6, A-7
	9–17	Very gravelly clay loam	GC, SC	A-6, A-7
	17	Weathered bedrock		
Rock outcrop part				
Concepcion:				
CcA	0–23	Loamy sand	SM	A-2
	23–37	Clay loam	CL	A-6, A-7
	37–64	Clay loam	CL	A-6
CgA, CgC, CgC2, CgD2, CgE2, CgF2	0–37	Fine sandy loam	SM, ML	A-4
	23–37	Clay loam	CL, CH	A-6, A-7
	37–64	Clay loam	CL	A-6
Cortina:				
CnC	0–60	Stony loamy sand, stony sandy loam	SP-SM	A-1
Crow Hill:				
CrC2, CrD, CrE	0–31	Silty clay loam	CL	A-6
	31	Unweathered bedrock		
Diablo:				
DaC, DaD, DaE2, DaF2	0–60	Clay	CL, CH	A-7
	60	Weathered bedrock		
Dune land:				
Du				
Elder:				
EaA, EaB	0–30	Sandy loam	SM	A-2, A-4
	30–72	Stratified loam to loamy sand	SM	A-2, A-4
EbE:				
Elder part	0–30	Sandy loam	SM	A-2, A-4
	30–72	Stratified loam to loamy sand	SM	A-2, A-4
Sobrante part	0–17	Stony loamy sand, stony sandy loam	GP-GM, SP-SM	A-1
	17–60	Very gravelly sand	GP-GM	A-1
Escarpment:				
ES				
Gaviota:				
GaE, GaF	0–15	Sandy loam	SM, ML	A-4, A-2
	15	Unweathered bedrock		
GbE:				
Gaviota part	0–10	Sandy loam	SM, ML	A-4, A-2
	10	Unweathered bedrock		
Rock outcrop part				

and classifications—Continued

Fragments > 3 inches	Percentage passing sieve number—				Liquid limit	Plasticity index
	4	10	40	200		
Pct					*Pct*	
0	100	100	60–95	30–75	20–35	5–10
0	100	100	50–100	30–50	15–30	NP–10
0	100	100	90–100	75–90	45–60	25–35
25–50	70–90	60–80	50–80	40–65	30–45	10–20
50–80	60–80	50–70	45–70	35–55	30–45	10–20
25–50	70–90	60–80	55–80	40–65	30–45	10–20
50–80	60–80	50–70	45–70	35–55	30–45	10–20
0	100	100	75–95	15–25		NP
0	100	100	90–100	65–85	35–50	15–25
0	100	100	90–100	70–80	30–40	10–20
0	100	100	65–80	35–55	20–30	NP–5
0	100	100	90–100	65–85	30–50	15–25
0	100	100	90–100	70–80	30–40	10–20
15–30	65–85	45–65	10–35	5–10		NP
0	95–100	95–100	90–100	85–90	30–40	10–20
0	100	95–100	95–100	85–100	45–75	20–40
0	80–100	75–100	50–70	30–50	10–20	NP–5
0	80–100	75–100	60–70	15–50	10–20	NP–5
0	80–100	75–100	50–70	30–50	10–20	NP–5
0	80–100	75–100	50–70	15–50	0–20	NP–5
10–30	40–60	30–40	20–30	5–10		NP
0–5	30–60	25–50	15–25	5–10		NP
0–5	75–100	70–100	65–95	30–65	20–35	NP–10
0–5	75–100	70–100	55–95	30–65	20–35	NP–10

TABLE 7.—*Engineering properties*

Soil name and map symbol	Depth	USDA texture	Classification	
			Unified	AASHTO
	In			
Gotsta:				
GcA, GcC	0–40	Fine sandy loam	CL, ML, SM, SC	A-2, A-4
	40–55	Stratified loamy sand to clay loam	CL–ML, ML, SM, SC, SM	A-4
	55–72	Fine sandy loam	CL, ML, ML, SM, SC, SM	A-4
GnA	0–40	Loam	CL–ML, SM, SC	A-2, A-4
	40–55	Stratified loamy sand to clay loam	CL, ML, ML, SM, SC, SM	A-4
	55–72	Fine sandy loam	CL, ML, ML, SM, SC, SM	A-4
Gullied land				
Gu				
Lame:				
LaF, LaF2, LaG	0–48	Clay loam	CL	A-6, A-7
	48	Weathered bedrock		
Lodo:				
LdC				
Lodo part	0–11	Gravelly clay loam	SM, SC, SC	A-2, A-4, A-6
	11	Unweathered bedrock.		
Rock outcrop part				
LdE				
Lodo part	0–11	Gravelly clay loam	SM–SC, SC	A-2, A-4, A-6
	11	Unweathered bedrock		
Sesame part	0–11	Clay loam	ML	A-4
	11–38	Clay loam, clay	CL	A-6
	38	Weathered bedrock		
Lopez:				
LdG, LdH:				
Lopez part	0–6	Shaly clay loam	GM	A-2
	6–16	Very shaly clay loam	GM	A-2
	16	Unweathered bedrock		
Rock outcrop part				
LeE2, LeF2				
Lopez part	0–6	Shaly clay loam	GM	A-2
	6–16	Very shaly clay loam	GM	A-2
	16	Unweathered bedrock.		
Santa Lucia part	0–24	Shaly clay loam	GM	A-2
	24	Unweathered bedrock		
Los Osos:				
LgE2, LgF2	0–10	Clay loam	CL	A-6, A-7
	10–34	Clay	CL	A-6, A-7
	34	Unweathered bedrock		
LkG:				
Los Osos part	0–10	Clay loam	CL	A-6, A-7
	10–34	Clay	CL	A-6, A-7
	34	Unweathered bedrock.		
Maymen part	0–4	Stony fine sandy loam	SM, ML	A-4
	4–14	Loam	CL–ML, CL	A-4, A-6
	14	Unweathered bedrock.		
Maymen:				
MaE, MaG	0–4	Stony fine sandy loam	SM, ML	A-4
	4–14	Loam	CL–ML, CL	A-4, A-6
	14	Unweathered bedrock		

and classifications—Continued

Fragments > 3 inches	Percentage passing sieve number—				Liquid limit	Plasticity index
	4	10	40	200		
Pct						
0	100	10[illegible]	60-9[illegible]	3[illegible]-75	20-3[illegible]	5-10
0	100	100	50-1[illegible]	[illegible]-[illegible]	15-30	NP-10
0	100	100	70-85	40-[illegible]5	15-25	NP-10
0	100	100	6[illegible]-95	30-75	2[illegible]-3[illegible]	5-10
0	100	100	5[illegible]-100	35-[illegible]5	15-30	NP-10
0	100	100	70-85	40-55	1[illegible]-25	NP-10
0	90-100	80-1[illegible]	8[illegible]-9[illegible]	70-95	30-50	20-30
0	80-95	55-75	35-[illegible]5	25-40	2[illegible]-30	5-15
0	80-95	7[illegible]-[illegible]5	45-50	25-40	3[illegible]-50	5-15
0	100	75-1[illegible]0	8[illegible]-00	55-[illegible]5	2[illegible]-40	NP-15
0	100	[illegible]-[illegible]0	8[illegible]-[illegible]	50-90	2[illegible]-4[illegible]	1[illegible]-25
0-15	75-65	2[illegible]-50	30-40	20-35	30-50	5-15
5-15	25-40	20-[illegible]5	[illegible]-30	15-30	40-[illegible]5	10-15
0-15	75-65	3[illegible]-50	30-40	20-35	3[illegible]-50	5-15
0-15	25-40	20-[illegible]5	20-30	15-30	4[illegible]-50	10-15
0	30-65	25-[illegible]5	25-40	20-35	40-55	1[illegible]-15
0	95-100	90-100	80-100	70-95	30-[illegible]5	10-25
0	85-100	90-100	90-100	80-95	3[illegible]-50	15-30
0	95-100	90-100	80-100	70-95	30-[illegible]5	10-25
0	95-100	90-100	80-100	80-95	[illegible]-[illegible]5	[illegible]-30
10-25	80-90	75-85	45-75	35-60	10-20	NP-5
0	8[illegible]-100	75-100	60-75	50-60	20-[illegible]	5-15
0-5	80-90	75-85	4[illegible]-5	35-60	10-20	NP-5
0	8[illegible]-100	75-100	[illegible]-75	[illegible]-[illegible]	2[illegible]-30	5-15

TABLE 7.—*Engineering properties*

Soil name and map symbol	Depth	USDA texture	Classification	
			Unified	AASHTO
	In			
Maymen: Cont.				
*MbH				
Maymen part	0–4	Stony fine sandy loam	SM, ML	A-4
	4–14	Loam	CL-ML, CL	A-4, A-6
	14	Unweathered bedrock		
Rock outcrop part				
MeE2				
Me	0–16	Loamy sand	SM	A-2
	16–66	Stratified sand to very fine sandy loam	SM	A-2
Milpitas:				
MdC, MdD, MdE, MdF	0–25	Fine sandy loam, loam	SM, SM-SC, ML, CL-ML	A-4
	25–54	Clay, sandy clay	CH, CL	A-7
	54–68	Very gravelly sandy loam	GM	A-1
*MdC				
Milpitas part	0–25	Fine sandy loam, loam	SM, SM-SC, ML, CL-ML	A-4
	25–54	Clay, sandy clay	CH, CL	A-7
	54–68	Very gravelly sandy loam	GM	A-1
Positas part	0–19	Fine sandy loam	SM	A-1, A-2
	19–41	Clay	CH, CL	A-7
	41–68	Clay loam	ML, CL	A-6, A-7
*MeE2, *MeF2, *MeF2				
Milpitas part	0–15	Fine sandy loam, loam	SM, SM-SC, ML, CL-ML	A-4
	15–54	Clay, sandy clay	CH, CL	A-7
	54–68	Very gravelly sandy loam	GM	A-1
Positas part	0–19	Fine sandy loam	SM	A-4, A-2
	19–41	Clay	CH, CL	A-7
	41–68	Clay loam	ML, CL	A-6, A-7
Montara				
MeF2	0–18	Sandy clay	CL, CH	A-7
	18	Unweathered bedrock		
Nacimiento:				
NeE2	0–42	Silty clay loam, clay loam	CL	A-6, A-7
	42–60	Weathered bedrock		
NeG				
Nacimiento part	0–42	Silty clay loam, clay loam	CL	A-6, A-7
	42–60	Weathered bedrock		
Landslide part				
Orthents				
OAG	0–60	Variable		
Pits and dumps:				
PA				
Riverwash				
RA				
Rock outcrop:				
*Rb				
Rock outcrop part				
Maymen part	0–4	Stony fine sandy loam	SM, ML	A-4
	4–14	Loam	CL, ML, CL	A-4, A-6
	14	Unweathered bedrock		

and classifications—Continued

Fragments > 3 inches	Percentage passing sieve number—				Liquid limit	Plasticity index
	4	10	40	200		
Pct						
0–5	80–90	75–85	45–75	35–60	10–20	NP–5
0	80–100	75–100	60–75	50–60	20–30	5–15
0	100	100	50–70	15–35		NP
0	100	100	60–80	15–35		NP
30–60	70–90	60–80	55–70	40–60	10–25	NP–10
30–50	80–90	70–80	60–70	50–65	40–50	[illegible]
0–10	40–60	20–40	20–40	15–25	15–10	NP–5
0	100	100	65–80	40–60	10–25	NP–10
0	100	100	85–100	60–90	45–60	30–40
0–15	40–60	25–50	20–40	15–25	10–[illegible]	NP–6
0–15	80–100	75–100	45–85	30–50	10–30	NP–5
0–15	80–100	75–100	75–100	70–95	40–65	25–40
0–15	80–100	75–100	70–100	60–80	30–45	10–20
0	100	100	65–80	40–60	10–25	NP–10
0	100	100	85–100	60–95	45–60	30–40
0–15	40–60	25–50	20–40	15–25	10–15	NP–5
0–15	80–100	75–100	45–85	30–50	10–30	NP–10
0–15	80–100	75–100	75–100	70–95	40–65	15–40
0–15	80–100	75–100	70–100	55–80	30–45	10–20
0–15	80–90	75–85	70–80	60–75	40–55	15–30
0	80–100	75–100	70–95	60–85	30–45	10–30
0	80–100	75–100	70–95	65–85	30–45	10–30
0–5	80–90	75–85	45–75	35–60	10–20	NP–5
0	80–100	75–100	60–75	50–60	20–30	5–15

TABLE 7.—*Engineering properties*

Soil name and map symbol	Depth	USDA texture	Classification	
			Unified	AASHTO
	In			
San Andreas				
[1] SaD2, [1] SaE2				
San Andreas part	0–28	Fine sandy loam	SM, ML	A-4
	28	Weathered bedrock.		
Tierra part	0–15	Sandy loam	SM, SC, ML, SM-SC, CL-ML	A-4
	15–29	Clay, sandy clay	CH, CL	A-6, A-7
	29–60	Sandy clay loam	SM, SC, CL-ML, CL, SC	A-2, A-4, A-6
[1] SaF2				
San Andreas part	0–22	Fine sandy loam	SM, ML	A-4
	22	Weathered bedrock.		
Tierra part	0–12	Sandy loam	SM, SC, ML, SM-CL, ML	A-4
	12–29	Clay, sandy clay	CH, CL	A-6, A-7
	29–60	Sandy clay loam	SM, SC, CL-ML, CL, SC	A-2, A-4, A-6
Sanitary landfill areas				
SB				
Santa Lucia	0–21	Shaly clay loam, very shaly clay loam	GM	A-2
SeD2, SeE2, SeF2, SeG	24	Unweathered bedrock.		
Tierra				
[2]				
Tierra part	0–8	Sandy loam	SM, SC, ML, SM-CL, ML	A-4
	8–29	Clay, sandy clay	CH, CL	A-6, A-7
	29–60	Sandy clay loam	SM, SC, CL-ML, CL, SC	A-2, A-4, A-6
San Andreas part	0–19	Fine sandy loam	SM, ML	A-4
	19	Weathered bedrock.		
Todos				
TbD2, TbE2	0–18	Clay loam	CL	A-6, A-7
	18–44	Clay	CL, CH	A-6, A-7
	44	Weathered bedrock		
[2]				
Todos part	0–18	Clay loam	CL	A-6, A-7
	18–44	Clay	CL, CH	A-6, A-7
	44	Weathered bedrock		
Lodo part	0–11	Gravelly clay loam	SM, SC, SC	A-2, A-4
	11	Unweathered bedrock.		
Xerorthents, cut and fill areas:				
XA				
Zaca				
ZaD2, ZaE2, ZaF2	0–48	Clay	CH	A-7
	48	Weathered bedrock		

[1] This mapping unit is made up of two or more contrasting kinds of soil. See description of the mapping unit for composition

and classifications Continued

Fragments > 3 inches	Percentage passing sieve number—				Liquid limit	Plasticity index
	4	10	40	200		
					Pct	
0	90–100	80–100	70–95	35–60	20–40	NP–10
0	100	100	70–95	40–75	20–35	5–10
0	100	100	90–100	70–95	35–55	10–30
0	100	100	60–100	30–80	20–40	5–15
0	90–100	80–100	70–95	35–60	20–40	NP–10
0	100	100	70–95	40–75	20–35	5–10
0	100	100	90–100	70–95	35–55	10–30
0	100	100	60–100	30–80	20–40	5–15
0	90–95	85–90	75–80	30–37	40–55	10–15
0	100	100	70–95	40–75	20–35	5–10
0	100	100	90–100	70–95	35–55	10–30
0	100	100	60–100	30–80	20–40	5–15
0	80–100	80–100	70–95	35–60	20–40	NP–10
0	100	100	90–100	70–80	30–50	10–25
0	100	100	90–100	75–95	35–55	15–35
0	80–95	50–75	35–50	20–40	20–30	5–15
0	100	100	90–100	75–95	50–60	30–50

and behavior characteristics of the whole mapping unit.

TABLE 8.—*Physical and chemical*

[Dashes indicate data were not available. The symbol < means less than; > means more than. Entries under

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity
	In	*In. hr*	*In. in*	*pH*	*Mmhos cm*
Agueda					
AgA, AgC, AgD	0–33	0.6–2.0	0.13–0.22	7.9–8.4	<2
	33–66	0.6–2.0	0.12–0.18	7.9–8.4	<2
AbC					
Agueda part	0–33	0.6–2.0	0.19–0.22	7.9–8.4	<2
	33–66	0.6–2.0	0.12–0.18	7.9–8.4	<2
Goleta part	0–10	0.6–2.0	0.16–0.25	6.6–7.8	
	4–16	0.6–2.0	0.15–0.18	6.6–8.4	<2
	55–72	0.6–2.0	0.11–0.13	6.6–8.4	<2
Aquents					
AC	0–60				
Aquepts					
AD	0–60				
Argixerolls					
Argixerolls part	0–48	0.06–0.2	0.17–0.21	8.1–8.4	<2
Xererts part	0–48	0.06–0.2	0.15–0.19	8.1–8.4	<2
Arnold					
AgD, AgE2, AgF2, AgG	0–58	0.0–20.0	0.05–0.09	6.6–7.8	
	58				
Ayar					
AhE2, AhF2, AhG	0–10	0.06–0.2	0.14–0.17	7.9–8.4	<2
	40				
Ballard					
BaA, BaC	0–31	0.6–2.0	0.13–0.17	7.4–8.0	
	31–42	0.6–2.0	0.14–0.15	8.4–8.4	
	42–60	0.6–2.0	0.14–0.17	8.4–8.4	
Ballard variant					
BC	0–24	0.6–2.0	0.18–0.21	7.9–8.4	
	24–35	0.6–2.0	0.18–0.20	8.4–8.4	
	35–60	2.0–6.0	0.05–0.07	8.4–8.4	
Baywood					
BF	0–62	0.6–2.0	0.17–0.21	7.9–8.4	
Beaches					
BE					
Botella					
BgA, BgC	0–5	0.2–0.6	0.17–0.18	7.9–8.4	
	5–72	0.2–0.6	0.16–0.19	7.9–8.4	
BkC	0–5	0.2–0.6	0.12–0.15	7.9–8.4	
	5–72	0.2–0.6	0.16–0.19	7.9–8.4	
Botella variant					
BkC2, BkD2	0	2.0–6.0	0.16–0.20	7.9–8.4	
	7–78	0.2–0.6	0.16–0.20	7.9–8.4	<2
	78–80	0.2–0.6	0.18–0.20	7.9–8.4	<2
Camarillo					
CaA	0–19	0.6–2.0	0.20–0.24	7.9–8.4	<2
	19–57	0.6–2.0	0.19–0.17	7.9–8.4	<2
Camarillo variant					
Cb					
	0–7	2.0–6.0	0.20–0.18	7.9–8.4	2–4
	7–35	0.6–2.0	0.08–0.18	7.9–8.4	2–4
	35–72	0.06–0.2	0.10–0.15	7.9–8.4	2–4

properties of soils

Erosion factors—I apply to the entire profile. Absence of an entry means data were not available or were not estimated.]

Shrink-swell potential	Risk of corrosion		Erosion factors	
	Uncoated steel	Concrete	K	T
Moderate	High	Low	0.37	5
Low	High	Low	0.24	
Moderate	High	Low	0.37	5
Low	High	Low	0.24	
Low	Moderate	Low	0.32	5
Low	High	Low	0.28	
Low	High	Low	0.28	
Moderate	High	Low	0.37	2
High	High	Low	0.[illegible]	2
Low	Moderate	Moderate	0.15	4
High	High	Low	0.28	3
Low	Moderate	Moderate	0.32	5
Low	Moderate	Moderate	0.28	
Low	Moderate	Moderate	0.24	
Low	Moderate	Moderate	0.28	5
Low	Moderate	Moderate	0.28	
Low	Moderate	Moderate	0.[illegible]	
Very low	Moderate	Moderate	0.[illegible]	5
Moderate	Moderate	Moderate	0.37	5
Moderate	Moderate	Moderate	0.32	
Moderate	Moderate	Moderate	0.28	5
Moderate	Moderate	Moderate	0.32	
Moderate	Moderate	Moderate	0.37	5
Moderate	High	Low	0.28	
Moderate	High	Low	0.32	
Low	High	Low	0.32	5
Low	High	Low	0.32	
Low	High	Low	0.32	5
Low	High	Low	0.32	
High	High	Low	0.24	

TABLE 8.—*Physical and chemical*

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity
	In	*In hr*	*In in*	*pH*	*Mmhos cm*
Capitan					
CaC	0–9	0.6–2.0	0.10–0.14	7.9–8.4	<2
	9–17	0.6–2.0	0.08–0.11	7.9–8.4	<2
	17				
CdG					
Capitan part	0–9	0.6–2.0	0.10–0.14	7.9–8.4	<2
	9–17	0.6–2.0	0.08–0.11	7.9–8.4	<2
	17				
Rock outcrop part					
Conception					
CeB	0–23	2.0–6.0	0.08–0.10	5.1–5.5	
	23–37	<0.06	0.14–0.18	6.1–6.5	
	37–64	0.06–0.2	0.15–0.18	5.6–6.0	
CgA, CgC, CgD2, CgF2, CgF	0–27	0.6–2.0	0.11–0.16	5.1–5.5	
	27–37	<0.06	0.14–0.18	5.1–5.5	
	37–64	0.06–0.2	0.15–0.18	5.6–6.0	
Cortina					
CnC	0–60	6.0–20	0.03–0.07	5.6–7.8	
Crow Hill					
CrC2, CrD2, CrE2	0–31	0.2–0.6	0.19–0.21	5.1–6.5	
	31				
Diablo					
DaC, DaD, DaF2, DaF2	0–50	0.06–0.2	0.14–0.19	6.6–8.4	<2
	50				
Dune land					
Du					
Elder					
EsA, EsB	0–30	0.6–2.0	0.10–0.15	6.6–8.4	
	30–72	0.6–2.0	0.10–0.17	6.6–8.4	<2
Eb					
Elder part	0–30	0.6–2.0	0.14–0.15	6.6–8.4	
	30–72	0.6–2.0	0.10–0.15	6.6–8.4	<2
Soboba part	0–17	>20	0.02–0.04	7.4–7.8	
	17–60	>20	0.01–0.03	7.4–7.8	<2
Escarpment					
Es					
Gaviota					
GaB, GaG	0–15	0.6–2.0	0.07–0.16	6.1–6.5	
	15				
GbG					
Gaviota part	0–10	0.6–2.0	0.07–0.16	6.1–6.5	
	10				
Rock outcrop part					
Goleta					
GtA, GtC, GtD	0–40	0.6–2.0	0.10–0.15	6.6–8.4	<2
	40–55	0.6–2.0	0.08–0.13	6.6–8.4	<2
	56–72	0.6–2.0	0.11–0.13	6.6–8.4	<2
Gullied land					
Gu					
Linne					
LnE, LnF2, LnG	0–48	0.2–0.6	0.17–0.20	7.9–8.4	<2
	48				

properties of soils—Continued

Shrink-swell potential	Risk of corrosion		Erosion factors	
	Uncoated steel	Concrete	K	T
Moderate	High	Low	0.24	1
Moderate	High	Low	0.24	
Moderate	High	Low	0.24	1
Low	High	Low	0.24	
Low	Moderate	Moderate	0.28	5
High	High	Moderate		
Moderate	High	Moderate	0.32	
Low	High	Moderate	0.32	5
High	High	Moderate	0.43	
Moderate	High	Moderate	0.32	
Low	Moderate	Low	.15	5
Low	Moderate	Moderate	0.43	2
High	High	Low	0.24	3
Low	Moderate	Moderate	0.32	5
Low	High	Moderate	0.32	
Low	Moderate	Moderate	0.32	5
Low	High	Moderate	0.32	
Low	Low	Low	0.15	5
Low	Moderate	Low	0.15	
Low	Moderate	Low	0.43	1
Low	Moderate	Low	0.49	1
		Low		
Low	High	Low	0.32	5
Low	High	Low	0.28	
Low	High	Low	0.28	
Moderate	High	Low	0.28	2

TABLE 8.—*Physical and chemical*

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity
	In	*In/hr*	*In/in*	*pH*	*Mmhos/cm*
Lodo					
LcG					
Lodo part	0–11	0.6–2.0	0.12–0.16	7.4–7.8	<2
	11				
Rock outcrop part					
LeG					
Lodo part	0–11	0.6–2.0	0.12–0.16	7.4–7.8	<2
	11				
Sespe part	0–11	0.2–0.6	0.15–0.21	6.1–8.4	<2
	11–36	0.06–0.2	0.15–0.17	6.1–8.4	<2
	36				
Lopez					
LoD, LoE					
Lopez part	0–6	0.6–2.0	0.10–0.14	5.6–6.0	
	6–16	0.6–2.0	0.08–0.12	5.6–6.0	
	16				
Rock outcrop part.					
LpE2, LpF2					
Lopez part	0–6	0.6–2.0	0.10–0.14	5.6–6.0	
	6–16	0.6–2.0	0.08–0.12	5.6–6.0	
	16				
Santa Lucia part	0–24	0.6–2.0	0.10–0.14	5.6–6.5	
	24				
Los Osos:					
LsE2, LsF2	0–10	0.2–0.6	0.17–0.21	6.6–7.8	
	10–34	0.06–0.2	0.15–0.18	6.6–7.8	
	34				
LtC					
Los Osos part	0–10	0.2–0.6	0.17–0.21	6.6–7.8	
	10–34	0.06–0.2	0.15–0.18	6.6–7.8	
	34				
Maymen part	0–4	0.6–2.0	0.12–0.14	5.1–6.5	
	4–14	0.6–2.0	0.12–0.14	5.1–6.5	
	14				
Maymen					
MaC, MaD	0–4	0.6–2.0	0.12–0.14	5.1–6.5	
	4–14	0.6–2.0	0.12–0.14	5.1–6.5	
	14				
MbF					
Maymen part	0–4	0.6–2.0	0.12–0.14	5.1–6.5	
	4–14	0.6–2.0	0.12–0.14	5.1–6.5	
	14				
Rock outcrop part					
Metz					
MeE	0–16	2.0–6.0	0.07–0.10	6.6–8.4	<2
	16–66	6.0–20.0	0.07–0.10	7.9–8.4	<2
Milpitas:					
MdC, MdD, MdE, MdF	0–25	0.6–2.0	0.11–0.17	5.6–7.8	
	25–54	<0.06	0.04–0.06	5.6–7.8	
	54–68	6.0–20	0.05–0.08	5.6–7.8	
MeC					
Milpitas part	0–25	0.6–2.0	0.11–0.17	5.6–7.8	
	25–54	<0.06	0.04–0.06	5.6–7.8	
	54–68	6.0–20	0.05–0.08	5.6–7.8	

properties of soils—Continued

Shrink-swell potential	Risk of corrosion		Erosion factors	
	Uncoated steel	Concrete	K	T
Moderate	Moderate	Low	0.20	1
Moderate	Moderate	Low		1
Moderate Moderate	High High	Moderate Moderate		3
Low Low	Moderate Moderate	Moderate Moderate	0.15 .10	1
Low Low	Moderate Moderate	Moderate Moderate	0.1 0.1	1
Low	High	High	0.15	2
High High	Moderate Moderate	Moderate Moderate	0.28 0.28	2
High High	Moderate Moderate	Moderate Moderate	0.32 0.28	2
Low Low	High High	High High	0.17 0.24	1
Low Low	High High	High High	0.17 0.24	1
Low Low	High High	High High	0.17 0.24	1
Low Low	High High	Low Low	0.49 0.49	5
Low High Low	Moderate High Moderate	Moderate Moderate Moderate	0.24 0.32	3
Low High Low	Moderate High Moderate	Moderate Moderate Moderate	0.24 0.32	3

TABLE 8.—*Physical and chemical*

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity
	In	*In/hr*	*In/in*	*pH*	*Mmhos/cm*
Milpitas: Cont.					
MaC:					
Positas part	0–19	0.6–2.0	0.10–0.13	6.1–6.5	
	19–41	<0.06	0.03–0.05	6.6–7.[illegible]	
	41–68	<0.06	0.03–0.05	6.1–8.4	<2
MaD2, MaE2, MaF2:					
Milpitas part	0–15	0.6–2.0	0.11–0.17	5.6–7.8	
	15–54	<0.06	0.04–0.06	6.6–7.8	>2
	54–68	6.0–20	0.05–0.08	5.6–7.8	<2
Positas part	0–19	0.6–2.0	0.10–0.13	6.1–6.5	---
	19–41	<0.06	0.03–0.05	6.[illegible]–7.[illegible]	
	41–68	<0.06	0.03–0.05	6.1–8.4	<2
Montara:					
MgF2	0–18	0.2–0.6	0.14–0.16	7.9–8.4	<2
	18	---	---	---	---
[illegible]:					
[illegible]	0–42	0.2–0.6	0.17–0.19	7.9–8.4	<2
	42–60	---	---	---	---
[illegible]:					
Nacimiento part	0–42	0.2–0.6	0.17–0.19	7.9–8.4	<2
	42–60	---	---	---	---
Landslide part	---	---	---	---	---
[illegible]:					
[illegible]	0–60	---	---	---	---
Pits and dumps:					
PA	---	---	---	---	---
Riverwash:					
RA	---	---	---	---	---
Rock outcrop:					
[1]Rb:					
Rock outcrop part	---	---	---	---	---
Maymen part	0–4	0.6–2.0	0.12–0.14	5.1–5.5	
	4–14	0.6–2.0	0.12–0.14	5.1–5.5	---
	14	---	---	---	---
San Andreas:					
[1][illegible]:					
San Andreas part	0–28	2.0–6.0	0.11–0.1[illegible]	5.6–6.0	
	28	---	---	---	---
Tierra part	0–1[illegible]	0.6–2.0	0.1[illegible]–0.1[illegible]	5.1–6.[illegible]	
	15–29	<0.06	0.[illegible]–0.04	5.1–7.8	---
	29–60	0.2–0.6	0.02–0.04	7.9–8.4	<2
[1]SaE2:					
San Andreas part	0–28	2.0–6.0	0.11–0.17	5.6–6.0	
	28	---	---	---	---
Tierra part	0–15	0.6–2.0	0.12–0.17	5.1–6.0	
	15–29	<0.06	0.[illegible]–0.04	5.1–7.8	---
	29–60	0.2–0.6	0.02–0.04	7.9–8.4	<2
[1]SaF2:					
San Andreas part	0–22	2.0–6.0	0.11–0.17	5.6–6.0	---
	22	---	---	---	---
Tierra part	0–12	0.6–2.0	0.12–0.17	5.1–6.0	---
	12–29	<0.06	0.02–0.04	5.1–7.8	
	29–60	0.2–0.6	0.02–0.04	7.9–8.4	<2

properties of soils—Continued

Shrink-swell potential	Risk of corrosion		Erosion factors	
	Uncoated steel	Concrete	K	T
Low	Moderate	Low	0.37	5
High	High	Moderate	0.3	
Moderate	High	Moderate	0.17	
Low	Moderate	Moderate	0.24	3
High	High	Low	0.32	
Low	High	Low		
Low	Moderate	Low	0.37	5
High	High	Moderate	0.37	
Moderate	High	Moderate	0.37	
Moderate	High	Low	0.28	1
Moderate	High	Low	0.32	2
Moderate	High	Low	0.32	2
Low	High	High	0.17	1
Low	High	High	0.24	
Low	Moderate	Moderate	0.16	2
Low	High	Moderate	0.3	1
High	High	Moderate	0.28	
Moderate	High	Low	0.2	
Low	Moderate	Moderate	0.10	2
Low	Moderate	Moderate	0.37	1
High	Moderate	Moderate	0.28	
Moderate	High	Moderate	0.3	
Low	Moderate	Moderate	0.15	2
Low	Moderate	Moderate	0.37	1
High	Moderate	Moderate	0.28	
Moderate	High	Moderate	0.37	

TABLE 8.—*Physical and chemical*

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity
	In	*In/hr*	*In/in*	*pH*	*Mmhos/cm*
Sanitary landfill areas SB.					
Santa Lucia ScD2, ScE2, ScF2, ScG	0–24	0.6–2.0	0.10–0.14	5.1–6.5	--
	24				
Tierra TaE2					
Tierra part	0–8	0.6–2.0	0.12–0.17	5.1–6.5	--
	8–29	<0.06	0.03–0.04	5.1–7.8	
	29–60	0.2–0.6	0.12–0.14	7.9–8.4	<2
San Andreas part	0–19	2.0–6.0	0.11–0.17	5.6–6.0	
	19				
Todos TbD2, TbE2	0–18	0.06–2.0	0.15–0.19	6.1–6.5	
	18–44	0.6–2.0	0.14–0.17	6.6–8.4	<2
	44				
TF.					
Todos part	0–8	0.06–0.2	0.15–0.19	6.1–6.5	
	18–44	0.6–2	0.15–0.17	6.6–8.4	<2
	44				
Lodo part	0–11	0.2–2.0	0.12–0.16	7.4–7.8	<2
	11				
Xerorthents, cut and fill areas: XA.					
Zuca ZaD2, ZaE2, ZaF2	0–48	0.2–0.6	0.15–0.19	7.9–8.4	<2
	48				

[illegible] mapping unit. See description of the mapping unit for composition and

relationships between the soil characteristics observed in the field—soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for water movement in a vertical direction when the soil is saturated. Not considered in the estimates are lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in the planning and design of irrigation systems. In evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops and ornamental or other plants to be grown, in evaluating soil amendments for fertility and stabilization, and in evaluating the corrosivity of soils.

Salinity is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25° C. Estimates are based on field and laboratory measurements at representative sites of the nonirrigated soils. The salinity of [illegible] irrigated fields is largely affected by the quality of the irrigation water and the irrigation practices. Hence, the salinity of individual fields can differ greatly from the value given in table 8. Salinity affects the suitability of a soil for crop production, its stability when used as a construction material, and its potential to corrode metal and concrete.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others it was estimated on the basis of the kind of clay and on measurements of similiar soils. Size of imposed loadings and the magnitude of changes

properties of soils—Continued

Shrink-swell potential	Risk of corrosion		Erosion factors	
	Uncoated steel	Concrete	K	T
Low	High	High	0.15	2
Low	High	Moderate	0.37	1
High	High	Moderate	0.28	
Moderate	High	Low	0.37	
Low	Moderate	Moderate	0.15	2
Moderate	Moderate	Low	0.28	3
High	High	Low	0.24	
Moderate	Moderate	Low	0.28	3
High	High	Low	0.24	
Moderate	High	Low	0.20	1
High	High	Low	0.24	4

behavior characteristics of the whole mapping unit.

in soil moisture content are also important factors that influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A *high* shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Risk of corrosion, as used in table 8 pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rating of soils for corrosivity to concrete is based mainly on the sulfate content, soil texture, and acidity. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Installations of steel that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations entirely within one kind of soil or within one soil horizon.

Erosion factors (*11*) are used to predict the amount of erosion that will result from specific kinds of land treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soils to erosion by water. Soils having the highest K values are the most erodible. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or wind, that may occur without reducing crop production or environmental quality.

Soil and water features

Features that relate to runoff or infiltration of water, to flooding, to grading and excavation, and to subsidence and frost action of each soil are indicated in table 9. This information is helpful in planning land uses and engineering projects that are likely to be affected by the amount of runoff from watershed, by flooding and a seasonal high water table, by the presence of bedrock or a cemented pan in the upper 5 or 6 feet of the soil, by subsidence, or by frost action.

Hydrologic groups are used to estimate runoff after rainfall. Soil properties that influence the minimum rate of infiltration into the bare soil after prolonged wetting are depth to a water table, water intake rate and permeability after prolonged wetting, and depth to layers of slowly or very slowly permeable soil.

TABLE 9.—*Soil and*

[Absence of an entry indicates that the feature is not a concern. The definitions of "flooding" and "water table" in

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
Agueda: AaA, AaC, AaD	B	Rare									
AbC: Agueda part	B	Rare									
Goleta part	B	Rare									
Aguents: Ac	C	Rare									
Anacapa: AD	A	Frequent	Brief	Jan-Dec							
Argixerolls: AE											
Argixerolls part	C	None									
Xerorthents part	D	None									
Arnold: AfE2, AgF2, AhF2	B	None									
Azule: AkE2, AkF2, AkG	D	None									
Ballard: BaA, BaC	B	None									
Ballard variant: BbC	B	None									
Baywood: BeC	A	None									
Beaches: BY											
Botella: BgA, BnC, BhC	B	None									
Botella variant: BkC2, BkD2	B	None									
Camarillo: Ca	C	Common	Brief	Nov-Mar							
Camarillo variant: Cb	C	Common	Brief	Nov-Mar							
Captan: CcF	D	None									
CcG: Captan part	D	None									
Rock outcrop part											
Concepcion: CeB, CgA, CgC, CgC2, CgD2, CgE2, CgF2	D	None									
Cortina: CkC	A	Common	Very brief	Nov-Mar							
Crow Hill: CkD2, CkE2, CkF, CkG	C	None									

water features

the Glossary explain terms such as "rare," "brief," "apparent," and "perched." The symbo > means more than

High water table			Bedrock	
Depth	Kind	Months	Depth	Hardness
Ft			*In*	
>6.0			>60	
>6.0			>60	
>6.0			60	
2.0-6.0	Apparent	Jan-Dec	>60	
0-1.0	Apparent	Jan-Dec	>60	
>6.0			>40	Rippable.
>6.0			>40	Rippable.
>6.0			40-60	Rippable.
>6.0			40-60	Rippable.
>6.0			>60	
>6.0			>60	
>6.0			>60	
>6.0			>60	
>6.0			>60	
1.0-6.0	Apparent	Jan-May	>60	
1.0-6.0	Apparent	Jan-Apr	>60	
>6.0			4-18	Rippable.
>6.0			4-18	Rippable.
>6.0			>60	
>6.0			>60	
>6.0			20-40	Rippable.

TABLE 9.—*Soil and*

Soil name and map symbol	Hydrologic group	Flooding		
		Frequency	Duration	Months
Diablo				
DaC, DaD, DaE2, DaF2	D	None		
Dune land				
DL				
Elder:				
EaA, EaB	B	Rare		
Eb				
Elder part	B	Rare		
Soboba part	A	Common	Very brief	Nov.-Mar.
Escarpment:				
ES				
Gaviota				
GaE, GaG	D	None		
Gb				
Gaviota part	D	None		
Rock outcrop part				
Goleta				
GcA, GcC, GdA	B	Rare		
Gullied land				
Gu				
Linne				
LeE, LeF2, LeG	C	None		
Lodo				
LbE2				
Lodo part	D	None		
Rock outcrop part				
LcF				
Lodo part	D	None		
Soupe part	C	None		
Lopez				
LdE, LdH				
Lopez part	D	None		
Rock outcrop part				
LeE2, LeF2				
Lopez part	D	None		
Santa Lucia part	C	None		
Los Osos				
LfE2, LfF2	C	None		
LgE				
Los Osos part	C	None		
Maymen part	D	None		
Maymen				
MaE, MaG	D	None		
MeH				
Maymen part	D	None		

water features—Continued

High water table			Bedrock	
Depth	Kind	Months	Depth	Hardness
Ft			*In*	
>6.0			40–60	Rippable.
>6.0			>60	
>6.0			>60	
>6.0			>60	
>6.0			10–20	Hard.
>6.0			10–20	Hard.
>6.0			>60	
>6.0			20–60	Rippable.
>6.0			6–20	Rippable.
>6.0			6–20	Rippable.
>6.0			24–40	Rippable.
>6.0			6–20	Hard.
>6.0			6–20	Hard.
>6.0			20–40	Hard.
>6.0			20–40	Hard.
>6.0			20–36	Hard.
>6.0			8–18	Hard.
>6.0			10–20	Hard.
>6.0			10–20	Hard.

TABLE 9.—*Soil and*

Soil name and map symbol	Hydrologic group	Flooding		
		Frequency	Duration	Months
Maymen Cont. MbH Rock outcrop part				
Metz Mc	A	Common	Brief	Nov-Mar
Milpitas: MdC, MdD, MdE, MdF	D	None		
[1] MeC, [1] MeD2 [1] MeE2 [1] MeF2 Milpitas part	D	None		
Positas part	D	None		
Montara: MgF2	D	None		
Nacimiento NaF2	C	None		
[1] NbG Nacimiento part	C	None		
Landslide part				
Orthents OAG	B	None		
Pits and dumps: PA				
Riverwash: RA				
Rock outcrop [1] RI Rock outcrop part				
Maymen part	D	None		
San Andreas [1] SaD2 San Andreas part	B	None		
Tierra part	D	None		
San Andreas, [1] SeF2 San Andreas part	B	None		
Tierra part	D	None		
[1] SeF2 San Andreas part	B	None		
Tierra part	D	None		
Sanitary landfill areas SB				
Santa Lucia: ScD2 ScE2 ScF2, ScG	C	None		
Tierra [1] TeE2 Tierra part	D	None		
San Andreas part	B	None		

water features—Continued

High water table			Bedrock	
Depth	Kind	Months	Depth	Hardness
Ft			In	
>6.0			>60	
>6.0			>60	
>6.0			>60	
>6.0			>60	
>6.0			10–20	Hard.
>6.0			40–70	Rippable.
>6.0			40–50	Rippable.
>6.0			>60	
>6.0			6–18	Hard.
>6.0			24–40	Rippable.
>6.0			>60	
>6.0			24–30	Rippable.
>6.0			>60	
>6.0			24–30	Rippable.
>6.0			>60	
>6.0			24–40	Hard.
>6.0			>60	
>6.0			24–30	Rippable.

TABLE 9.—*Soil and*

Soil name and map symbol	Hydrologic group	Flooding		
		Frequency	Duration	Months
Todos				
TbD2, TbE2	D	None		
dr2				
Todos part	D	None		
Lodo part	D	None		
Xerorthents, cut and fill areas				
XA				
Zaca				
ZaD2, ZaE2, ZaF2	D	None		

¹ In a mapping unit is made up of two or more kinds of so... See description of the mapping unit for composition

Flooding is rated in general terms that describe the frequency, duration, and period of the year when flooding is most likely. The ratings are based on evidences in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; absence of distinctive soil horizons that form in soils of the area that are not subject to flooding; local information about floodwater heights and the extent of flooding; and local knowledge that relates the unique landscape position of each soil to historic floods. Most soils in low positions on the landscape where flooding is likely to occur are classified as fluvents at the suborder level or as fluventic subgroups. See the section "Formation and Classification of the Soils."

The generalized description of flood hazards is of value in land use planning and provides a valid basis for land use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

A seasonal high water table is the highest level of a saturated zone more than 6 inches thick in soils for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed during the course of the soil survey. Indicated are the depth to the seasonal high water table; the kind of water table, whether perched, artesian, or the upper part of the ground water table; and the months of the year that the high water commonly is present. Only those saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not to construct basements and to determine how septic tank absorption fields and other underground instal ations will function. Also, a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, stated ranges in depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and other observations during the soil mapping. The relative hardness of the bedrock as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200–300 horsepower (flywheel) tractor, but hard bedrock generally requires blasting.

Engineering test data

Selected horizons from 10 soils in Santa Barbara County, South Coastal Part, were tested in the laboratory to help evaluate the soil properties significant to engineering purposes. Results of these tests are shown in table 10 "Engineering Test Data," along with the *soil name* and the *location* where it was sampled, *the depth* at which the sample was taken, and the *soil horizon* designation.

Mechanical analysis. The size and proportions of soil particles affect the behavior of soils for various engineering uses. The California Division of Highways uses the sieve and hydrometer method in determining the mechanical analysis.

Moisture-density relations. Moisture-density, or compaction test, is determined by compacting soil several times, using a constant compactive effort, each time at successively higher moisture contents. The density of the compacted soil increases as the moisture content increases until the optimum moisture content is reached; beyond this point, density decreases with an increase in moisture content. Maximum dry density and associated optimum moisture are thus determined.

Liquid limit and plasticity index (Atterberg limits) are tests to determine plastic limit and liquid limit which measure the effect of water on consistence of

water features—Continued

	High water table			Bedrock	
	Depth	Kind	Months	Depth	Hardness
	Ft			*In*	
	>6.0			40–60	Rippable.
	>6.0			40–60	Rippable.
	>6.0			6–20	Rippable.
	>6.0			40–55	Rippable.

and behavior characteristics of the whole mapping unit.

the soil. As the moisture content of a dry plastic soil increases, it changes from semisolid state to a plastic state. As the moisture content is further increased the material changes from a plastic state to a liquid state. The plastic limit is the moisture content at which the material passes from a semisolid state to a plastic state. The liquid limit is the moisture content at which the soil passes from a plastic state to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range in moisture content within which the soil is in a plastic condition. Moisture content, plastic and liquid limits, and the plasticity index are expressed as percent of dry weight of the soil. Not applicable to predominately gravelly or sandy soils.

Recreation

The soils of the survey area are rated in table 11 according to limitations that affect their suitability for camp areas, picnic areas, playgrounds, and paths and trails. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited in varying degree for recreational use by the duration of flooding and the season when it occurs. Onsite assessment of height, duration, and frequency of flooding is essential in planning recreational facilities.

In table 11 the limitations of soils are rated as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 11 can be supplemented by additional information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 4, and interpretations for dwellings without basements and for local roads and streets, given in table 3.

For all the listed recreational uses, swamps, marshes, peat bogs, rock outcrops, and the like are considered very severely limited.

Camp areas are used intensively for tents and small camp trailers and the accompanying activities of outdoor living. Little preparation of the site is required, other than shaping to heavy foot traffic and limited vehicular traffic. The best soils have mild slopes, good drainage, a surface free of rocks and coarse fragments, freedom from flooding during periods of heavy use, and a surface that is firm after rains but not dusty when dry.

Picnic areas are attractive natural or landscaped tracts used primarily for preparing meals and eating outdoors. These areas are subject to heavy foot traffic. Most of the vehicular traffic, however, is confined to access roads. The best soils are firm when wet but not dusty when dry, are free of flooding during the season of use, and do not have slopes or stoniness that greatly increase cost of leveling sites or of building access roads.

Playgrounds are areas used intensively for baseball, football, badminton, and similar organized games. Soils suitable for this use need to withstand intensive foot traffic. The best soils have a nearly level surface free of coarse fragments and rock outcrops, good drainage, freedom from flooding during periods of heavy use, and a surface that is firm after rains but not dusty when dry. If grading and leveling are required, depth to rock is important.

Paths and trails are used for local and cross country

TABLE 10.—*Engineering*

[Tests performed by California Division of Highways in accordance with procedures

Soil name and location	Report number	Depth	Horizon	Moisture density[1]	
				Maximum dry density	Optimum moisture
		In		*Lb./ft.*[3]	*Pct*
Ayar clay Corona del Mar Ranch, about ⅝ mile northeast of ranch headquarters, Goleta.	0571615 0571616 0571617	2–16 16–30 30–65	A12 A3 C		
Baywood loamy sand, Approximately 2 miles southeast of Carpinteria [illegible] corporation at 6325 Carpinteria Ave., edge of terrace break.	73–1184	14–33	A12	118.1	9.9
Botella silty clay loam [illegible] feet south of railroad and 600 feet west of San Augustine Cabana.	73–1186 73–1190	5–20 20–33	A12 B21t	105.6 108	11.8 7.3
Botella variant, silty clay loam. 2 miles northwest of Carpinteria, 120 feet north of Foothill Road, 190 feet west of road entrance to Pole Grounds	0571612 0571613 0571614	0–7 7–30 30–55	Ap A12 B21t		
Diablo clay: Corona del Mar Ranch, ¼ mile east of ranch headquarters Goleta.	0571618	0–30	A11		
Linne clay loam Hollister Ranch, 47 miles north, ½ mile west of intersection of Rancho Real and San Augustine Roads.	73–1185	14–29	A12	93.5	24.0
Los Osos clay loam: Hollister Ranch, 1½ miles north of San Augustine Beach, 400 feet west of Pescadero Creek.	73–1182 73–1187	0–10 10–23	A11 B21t	109.6 114.5	15.1 12.2
Milpitas fine sandy loam: Corona del Mar Ranch, 100 feet west of barn at ranch headquarters Goleta.	0571619 0571620	0–10 27–45	Ap B21t		
Milpitas fine sandy loam: Between U.S. 101 and railroad right-of-way 250 feet east of Winchester Canyon Road, Goleta.	057162[illegible] 0571622	25–33 33–42	B21t B22t		
Santa Lucia shaly clay loam Hollister Ranch on Rancho Real Road cut, 1,000 feet west of intersection to Scenic Canyon	73–1183	12–24	A12	75.3	35.9

[1] Based on tests of relative compaction of untreated and treated soils and aggregates, method No. Calif. 216 E.
[2] Mechanical analyses by California Division of Highways.

travel by foot or horseback. Design and layout should require little or no cutting and filling. The best soils are at least moderately well drained, are firm when wet but not dusty when dry, are flooded not more than once during the season of use, have slopes of less than 15 percent, and have few or no rocks or stones on the surface.

Wildlife Habitat

Wildlife is important in this survey area and contributes to the area's economy and enjoyment. Game animals, game birds, and fish provide hunting and fishing for sportsmen and enjoyment for people interested in nature. The area has habitat well suited to a variety of wild animals. In order to thrive, wild animals require a reliable supply of food and water and a habitat that is reasonably safe from predators. Most of the game animals and birds are protected by law so they can maintain or increase their population. Nongame animals and birds that are in danger of extinction are also protected by law. Some wild, destructive, or dangerous animals may be destroyed to protect crops, livestock, or other animals.

The bays and mouths of the Pacific Coast abound with marine birds and fish such as perch, flounder, sea bass, grunion, and smelt. Both recreational and commercial marine fishing are important to the area's economy.

test data

given in California Materials Manual for Testing and Control Procedures (3)]

Percentage passing sieve [1]—				Percentage smaller than [1]—				Liquid limit	Plasticity index	Classification	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHTO [1]	Unified
								Pct			
--	100	99	98	98	85	68	53	72	41	A-7-5(49)	CH
-------	----------	-------	99	99	86	74	59	73	43	A-7-5(50)	CH
100	99	98	83	82	76	------	----	60	32	A-7-5(30)	CH
----	100	92	19	18	13	7	4	[2]NP	NP	A-3-4(0)	SM
--- ----	100	98	82	79	61	47	37	30	18	A-6(10)	CL
-	100	97	82	80	62	47	39	35	15	A-6(12)	CL
--	100	96	63	56	35	25	19	28	11	A-6(4)	CL
---- ----	100	96	63	58	38	27	20	28	13	A-6(6)	CL
---- -	100	96	70	63	45	34	27	33	17	A-6(10)	CL
-- ----	100	99	93	92	77	66	51	66	39	A-7-5(42)	CH
94	93	89	80	77	61	47	38	53	22	A-7-5(20)	MH
----------	----------	100	98	94	67	47	36	40	18	A-6(0)	CL
--	----------	-	97	94	68	50	40	44	24	A-7-6(25)	CL
--- ----	100	99	54	47	30	17	13	NP	NP	A-4(0)	ML
---- ---	100	97	61	57	47	----------	36	41	21	A-7-6(11)	CL
---- ----	100	99	91	88	66	64	48	52	39	A-7-6(10)	CH
----------	100	99	88	85	60	47	41	47	29	A-7-6(27)	CL
95	93	86	70	68	52	33	26	61	17	A-7-5(15)	MH

[1] Based on Standard Specifications of Highway Materials and Methods of Sampling and Testing. AASHTO Designation M 145–49. (1)

[2] Nonplastic.

Fresh-water fishing is almost nonexistent except in a few private ponds and reservoirs.

The important game animals and birds in the area are deer, wild hog, rabbits, quail, pigeon, and dove. Some other wildlife common to the area are jackrabbit, raccoon, skunks, ground squirrel, gray squirrel, various snakes including rattlesnake, crow, hawks, roadrunner, turkey vulture, blackbirds, and numerous small birds. The sloughs of Carpinteria and Goleta and the Bird Refuge in Santa Barbara provide some shelter for migratory ducks and other wetland wildlife such as coot and heron.

Coyote, bobcat, and mountain lion are the main predatory animals.

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the development of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, inadequate, or inaccessible, wildlife will either be scarce or will not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by properly managing the existing plant cover, and by fostering the natural establishment of desirable plants.

In table 12 the soils in the survey area are rated

TABLE 11.—*Recreational development*

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Agueda:				
AaA, AaC	Moderate: floods, too clayey.	Moderate: too clayey	Moderate: floods, too clayey.	Moderate: too clayey
AaD	Moderate: floods, slope, too clayey	Moderate: too clayey	Severe: slope, too clayey.	Moderate: too clayey.
AbC				
Agueda part	Moderate: floods, too clayey	Moderate: too clayey	Moderate: floods, too clayey.	Moderate: too clayey
Goldsta part	Slight	Slight	Moderate: slope	Slight.
Argerts				
AC	Moderate: wetness	Moderate: wetness	Moderate: wetness	Moderate: wetness
Arveepts				
AD	Severe: floods, wetness	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.
Argixerolls				
AE				
Argixerolls part	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Xererts part	Severe: slope, too clayey	Severe: slope, too clayey	Severe: slope, too clayey	Severe: slope, too clayey.
Arnold				
AgB	Moderate: slope, too sandy	Moderate: slope, too sandy	Severe: slope	Moderate: slope, too sandy.
AgE2	Severe: slope	Severe: slope	Severe: slope	Moderate: slope, too sandy
AgF2, AgG	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Ayar				
AcE2	Severe: slope	Severe: slope	Severe: slope, too clayey	Moderate: too clayey, slope.
AcF2, AhC	Severe: slope	Severe: slope	Severe: slope, too clayey	Severe: slope.
Bailard				
BaA	Slight	Slight	Moderate: small stones	Slight
BaC	Slight	Slight	Moderate: slope, small stones.	Slight.
Bailard variant				
Bc	Moderate: large stones, small stones.	Moderate: large stones, small stones.	Severe: large stones, small stones.	Moderate: large stones, small stones.
Baywood				
BC	Moderate: too sandy, soil blowing	Moderate: too sandy, soil blowing	Severe: too sandy, soil blowing	Moderate: too sandy, soil blowing.
Beaches				
Be				
Bolfin				
BfA	Moderate: dusty	Moderate: dusty	Moderate: too clayey, percs slowly	Moderate: too clayey
BfC	Moderate: dusty	Moderate: dusty	Moderate: slope, too clayey	Moderate: too clayey
BhC	Moderate: dusty, small stones	Moderate: dusty, small stones.	Severe: small stones	Moderate: too clayey, small stones

TABLE 11 *Recreational development*—Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Botella variant				
BtC2	Moderate too clayey	Moderate dusty	Moderate slope, too clayey	Moderate: too clayey
BtD2	Moderate slope, dusty	Moderate slope dusty	Severe slope	Moderate: too clayey,
Camarillo				
Ca	Severe floods	Moderate wetness	Moderate wetness	Slight
Camarillo variant				
Cb	Severe floods	Moderate wetness	Moderate floods	Moderate wetness
Captan				
CcF	Severe slope	Severe slope	Severe slope small slones, depth to rock	Severe slope
CcG				
Captan part	Severe slope	Severe slope	Severe slope small stones, depth to rock	Severe slope
Rock outcrop part				
Concepcion				
CeB	Moderate: perco slowly.	Moderate too sandy	Moderate perco slowly slope	Moderate: too sandy
CgA	Moderate: perco slowly	Slight	Moderate perco slowly	Slight
CgC2	Moderate: perco slowly	Slight	Moderate perco slowly, slope	Slight.
CgD2	Moderate slope perco slowly	Moderate slope	Severe slope	Slight.
CkC2	Severe slope	Severe slope	Severe slope	Moderate: slope.
CkE2	Severe slope	Severe slope	Severe slope	Severe: slope.
Cortina				
Cr	Severe floods	Moderate small stones	Severe small stones	Moderate small stones.
Crow Hill				
CrC2	Moderate slope too clayey	Moderate slope too clayey	Severe slope	Moderate: too clayey, slope.
CrD2	Severe slope	Severe slope	Severe slope	Moderate: too clayey slope.
CrE, CrG	Severe slope	Severe slope	Severe slope	Severe: slope
Diablo				
DaC	Moderate too clayey	Moderate: too clayey	Severe too clayey	Moderate. too clayey.
DaD	Moderate: too clayey, slope.	Moderate: too clayey, slope.	Severe slope too clayey	Moderate: too clayey
DaE2	Severe slope	Severe slope	Severe slope too clayey	Moderate: too clayey slope.
DaF2	Severe slope	Severe slope	Severe slope too clayey	Severe: slope.
Durisland				
Du				
Elder				
EaA	Severe floods	Moderate floods	Moderate floods	Slight.
EaE	Severe floods	Moderate floods	Moderate slope, floods.	Slight

TABLE 11.—*Recreational development*—Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Elder: Cont.				
*Eb Elder part	Severe: floods	Moderate: floods	Moderate: slope, floods	Slight.
Soboba part	Severe: floods	Severe: too sandy	Severe: large stones, small stones, slope	Moderate: large stones, too sandy, floods
Escarpment Es				
Gaviota GaF	Severe: slope	Severe: slope	Severe: slope, depth to rock	Moderate: slope
GaG	Severe: slope	Severe: slope	Severe: slope, depth to rock	Severe: slope.
*GbC Gaviota part	Severe: slope	Severe: slope	Severe: slope, depth to rock	Severe: slope.
Rock outcrop part				
Goleta GcA, GdA	Slight	Slight	Slight	Slight
GcC	Slight	Slight	Moderate: slope	Slight.
Gullied land Gu				
Lane LaB	Severe: slope	Severe: slope	Severe: slope	Moderate: too clayey
LaB2	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Lodo *LbG Lodo part	Severe: slope	Severe: slope	Severe: slope, depth to rock	Severe: slope.
Rock outcrop part				
*LcG Lodo part	Severe: slope	Severe: slope	Severe: slope, depth to rock	Severe: slope.
Sespe part	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Lopez: *LeG, *LeH Lopez part	Severe: slope	Severe: slope	Severe: slope, small stones, depth to rock	Severe: slope.
Rock outcrop part				
*LeF2 Lopez part	Severe: slope	Severe: slope	Severe: slope, small stones, depth to rock	Moderate: slope, small stones.
Santa Lucia part	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.
*LeF2x Lopez part	Severe: slope	Severe: slope	Severe: slope, small stones, depth to rock	Severe: slope.
Santa Lucia part	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
Los Osos LoE2	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.

TABLE 11.—*Recreational development*—Continued

Soil name and map symbo	Camp areas	Picnic areas	Playgrounds	Paths and trails
Los Osos: Cont				
LoF2	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
LtG				
Los Osos part	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Maymen part	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Maymen				
MaF	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
MaG	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
MEH				
Maymen part	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Rock outcrop part				
Metz				
Mz	Severe: floods	Moderate: too sandy	Moderate: too sandy, floods.	Moderate: too sandy
Milpitas				
MdC	Moderate: perco slowly, large stones.	Moderate: large stones	Severe: large stones, perco slowly.	Moderate: large stones
MdD	Moderate: perco slowly, large stones.	Moderate: slope, large stones	Severe: slope, large stones, perco slowly	Moderate: large stones
MdE	Severe: slope	Severe: slope	Severe: slope, large stones, perco slowly	Moderate: slope, large stones
MdF	Severe: slope	Severe: slope	Severe: slope, large stones, perco slowly	Severe: slope.
MeC				
Milpitas part	Moderate: perco slowly	Slight	Severe: perco slowly	Slight
Positas part	Moderate: perco slowly.	Slight	Moderate: slope, perco slowly.	Slight
MeD2				
Milpitas part	Moderate: slope, perco slowly.	Moderate: slope	Severe: slope, perco slowly.	Slight
Positas part	Moderate: slope, perco slowly	Moderate: slope	Severe: slope	Slight
MeF2				
Milpitas part	Severe: slope	Severe: slope	Severe: slope, perco slowly	Moderate: slope
Positas part	Severe: slope	Severe: slope	Severe: slope	Moderate: slope
MeE2				
Milpitas part	Severe: slope	Severe: slope	Severe: slope, large stones, perco slowly	Severe: slope.
Positas part	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Montara				
MrF2	Severe: slope	Severe: slope	Severe: slope, too clayey	Severe: slope.
Nacimiento:				
NaF2	Severe: slope	Severe: slope	Severe: slope	Severe: slope
NbG				
Nacimiento part	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Landslide part				

TABLE 11.—*Recreational development*—Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Orthents OAG	Severe slope	Severe slope	Severe slope	Severe slope
Pits and dumps: PA				
Riverwash: RA				
Rock outcrop Rb				
Rock outcrop part				
Maymen part	Severe slope	Severe slope	Severe slope	Severe slope
San Andreas SaD2				
San Andreas part	Moderate slope	Moderate slope	Severe slope	Slight
Tierra part	Severe percs slowly	Moderate slope	Severe slope, percs slowly	Slight
SaE2				
San Andreas part	Severe slope	Severe slope	Severe slope	Moderate slope
Tierra part	Severe slope, percs slowly	Severe slope	Severe slope, percs slowly	Moderate slope
SaF2				
San Andreas part	Severe slope	Severe slope	Severe slope	Severe slope
Tierra part	Severe slope, percs slowly	Severe slope	Severe slope, percs slowly	Severe slope
Sanitary landfill areas				
Santa Lucia: ScD2	Severe small stones	Severe small stones	Severe slope, small stones	Severe small stones
ScE2	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe small stones
ScF2, ScG	Severe slope, small stones.	Severe slope, small stones	Severe slope, small stones	Severe slope, small stones
Tierra: TcE				
Tierra part	Severe: slope	Severe slope	Severe slope, percs slowly	Moderate slope
San Andreas part	Severe: slope	Severe slope	Severe slope	Moderate slope
Todos TbD2	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope, too clayey	Moderate too clayey
TbE2	Severe slope	Severe slope	Severe slope, too clayey	Moderate too clayey, slope
TcF2				
Todos part	Severe slope	Severe slope	Severe slope, too clayey	Severe slope
Lodo part	Severe slope	Severe slope	Severe slope, depth to rock	Severe slope
Xerorthents, cut and fill, areas XA				

TABLE 11.—*Recreational development*—Continued

Soil name and map symbo	Camp areas	Picnic areas	Playgrounds	Paths and trails
Zaca				
ZaD2	Moderate too clayey	Moderate too clayey	Severe slope too clayey	Moderate: too clayey
ZaE2	Severe slope	Severe slope	Severe slope too clayey	Moderate slope too clayey
ZaF2	Severe slope	Severe slope	Severe slope too clayey	Severe slope.

This mapping unit is made up of two or more dominant kinds of soil. See description of the mapping unit for composition and behavior characteristics of the whole mapping unit.

according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in—

1. Planning the use of parks, wildlife refuges, nature study areas, and other developments for wildlife.
2. Selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat.
3. Determining the intensity of management needed for each element of the habitat.
4. Determining areas that are suitable for acquisition to manage for wildlife.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderate intensity of management and fairly frequent attention are required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and requires intensive effort. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of wildlife are very severe, and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

The elements of wildlife habitat are briefly described in the following paragraphs.

Grain and seed crops are seed-producing annuals used by wildlife. Examples are oats and barley. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Examples are sudangrass, hardinggrass, blando brome, annual ryegrass, clover, and alfalfa. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations.

Wild herbaceous plants are native or naturally established herbaceous grasses and forbs, including weeds, that provide food and cover for wildlife. Examples are wild oats, wild mustard, vetch, soft chess, ripgut, red brome, and filaree. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations.

Shrubs are bushy woody plants that produce fruits, buds, twigs, bark, or foliage used by wildlife or that provide cover and shade for some species of wildlife. Examples are chamise, manzanita, ceanothus, scrub oak, black sage, California sage and toyon. Major soil properties that affect the growth of shrubs are depth of root zone, available water capacity, salinity, and moisture.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Examples of wetland plants are saltbush, pickleweed, saltgrass, and cattail. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness.

Shallow water areas are bodies of surface water that have an average depth of less than 5 feet and are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control devices in marshes or streams. Examples are marshes, waterfowl feeding areas, wildlife watering developments, and other wildlife ponds. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of adequate water supply is important if water areas are to be developed.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat consists of croplands, pastures, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these

TABLE 12.—*Wildlife*

[See text for definitions of "good," "fair," "poor," and "very

Soil name and map symbol	Potential for habitat elements—			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs
Agueda				
AgA, AgC	Fair	Good	Good	Fair
AgD	Fair	Good	Good	Fair
AbC				
Agueda part	Fair	Good	Good	Fair
Greata part	Good	Good	Good	Good
Aquents				
Aq				
Aquepts				
Ap	Very poor	Very poor	Very poor	Very poor
Argixerolls				
AA				
Argixerolls part	Very poor	Very poor	Good	Good
Xerorthents part	Very poor	Very poor	Fair	Fair
Arnold				
AgD	Fair	Good	Fair	Fair
AgE2	Poor	Fair	Fair	Fair
AgE2, AgG	Very poor	Very poor	Fair	Fair
Ayar				
AhE2	Fair	Good	Poor	Poor
AhE2	Poor	Fair	Poor	Poor
AhG	Very poor	Very poor	Poor	Poor
Ballard				
BaA, BaC	Fair	Good	Good	Good
Ballard variant				
BhC	Poor	Poor	Good	Good
Bayw				
B	Fair	Good	Fair	Fair
Beaches				
B				
Botella				
BA	Fair	Good	Good	Good
BaC, BC	Fair	Good	Good	Good
Botella variant				
Bv2, Bv3	Fair	Good	Good	Good
Camarillo				
Ca	Fair	Fair	Good	Good
Camarillo variant				
Cb	Fair	Fair	Good	Fair
Captan				
CaF	Very poor	Very poor	Poor	Poor
CaG				
Captan part	Very poor	Very poor	Poor	Poor
Rock outcrop part				
Concepcion				
CaA	Poor	Fair	Fair	Fair
CaC, CaC2	Poor	Good	Good	Good
CbA	Fair	Good	Good	Good
CbD2, CbF2	Poor	Fair	Good	Good
CgE2	Very poor	Very poor	Good	Good

habitat potentials

poor." Absence of an entry indicates that the soil was not rated]

Potential for habitat elements—Continued		Potential as habitat for—		
Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Poor	Very poor	Good	Very poor	Fair
Very poor	Very poor	Good	Very poor	Fair
Poor	Very poor	Good	Very poor	Fair
Poor	Very poor	Good	Very poor	Good
Good	Good	Very poor	Good	Very poor
Very poor	Very poor	Poor	Very poor	Good
Very poor	Very poor	Poor	Very poor	Fair
Very poor	Very poor	Fair	Very poor	Fair
Very poor	Very poor	Fair	Very poor	Fair
Very poor	Very poor	Poor	Very poor	Fair
Very poor	Very poor	Fair	Very poor	Poor
Very poor	Very poor	Poor	Very poor	Poor
Very poor	Very poor	Very poor	Very poor	Poor
Poor	Very poor	Good	Very poor	Good
Poor	Very poor	Fair	Very poor	Good
Very poor	Very poor	Fair	Very poor	Fair
Fair	Fair	Good	Fair	Good
Poor	Very poor	Good	Very poor	Good
Very poor	Very poor	Good	Very poor	Good
Good	Good	Fair	Good	Good
Good	Good	Good	Good	Fair
Very poor	Very poor	Very poor	Very poor	Poor
Very poor	Very poor	Very poor	Very poor	Poor
Very poor	Very poor	Fair	Very poor	Fair
Very poor	Very poor	Fair	Very poor	Good
Poor	Very poor	Good	Very poor	Good
Very poor	Very poor	Fair	Very poor	Good
Very poor	Very poor	Poor	Very poor	Good

TABLE 12 *Wildlife habitat*

Soil name and map symbol	Potential for habitat elements			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs
Cortina:				
CbC	Poor	Fair	Good	Good
Crow Hill:				
CkD2, CkE2	Fair	Fair	Good	Good
CkF	Poor	Fair	Good	Good
CtG	Very poor	Very poor	Good	Good
Diablo:				
DaC, DaD, DaE2	Fair	Good	Poor	Poor
DsF2	Poor	Fair	Poor	Poor
Dune land:				
D				
Elder:				
EaA, EaB	Fair	Good	Good	Good
Elk:				
Elder part	Fair	Good	Good	Good
Soboba part	Very poor	Very poor	Poor	Poor
Escarpment:				
ES				
Gaviota:				
[illegible]	Poor	Poor	Fair	Poor
[illegible]	Very poor	Very poor	Fair	Poor
Gk:				
Gaviota part	Very poor	Very poor	Fair	Poor
Rock outcrop part				
Goleta:				
GcA, GcC, GdA	Good	Good	Good	Good
Gravelly land:				
[illegible]				
Lompoc:				
[illegible]	Fair	Good	Good	Good
LpF2	Poor	Fair	Good	Good
[illegible]	Very poor	Very poor	Good	Good
Lodo:				
LoG:				
Lodo part	Very poor	Very poor	Poor	Poor
Rock outcrop part				
LsG:				
Lodo part	Very poor	Very poor	Poor	Poor
Sespe part	Very poor	Very poor	Good	Good
Lopez:				
LuC, LuD:				
Lopez part	Very poor	Very poor	Poor	Poor
Rock outcrop part				
LvF2:				
Lopez part	Very poor	Very poor	Poor	Poor
Santa Lucia part	Fair	Good	Fair	Fair
LwF2:				
Lopez part	Very poor	Very poor	Poor	Poor
Santa Lucia part	Poor	Fair	Fair	Fair
Los Osos:				
LxC2	Fair	Good	Good	Good
LxF2	Poor	Fair	Good	Good

potentials—Continued

Potential for habitat elements—Continued		Potential as habitat for—		
Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Range and wildlife
Poor	Very poor	Fair	Very poor	Good
Very poor	Very poor	Fair	Very poor	Good
Very poor	Very poor	Poor	Very poor	Good
Very poor	Very poor	Poor	Very poor	Good
Very poor	Very poor	Fair	Very poor	Poor
Very poor	Very poor	Poor	Very poor	Poor
Very poor	Very poor	Good	Very poor	Good.
Very poor	Very poor	Good	Very poor	Good.
Very poor	Very poor	Poor	Very poor	Poor
Very poor	Very poor	Poor	Very poor	Poor
Very poor	Very poor	Poor	Very poor	Poor
Poor	Very poor	Good	Very poor	Good
Very poor	Very poor	Good	Very poor	Good
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Poor	Very poor	Good
Very poor	Very poor	Very poor	Very poor	Poor
Very poor	Very poor	Poor	Very poor	Good
Very poor	Very poor	Very poor	Very poor	Poor
Very poor	Very poor	Very poor	Very poor	Poor
Very poor	Very poor	Fair	Very poor	Fair
Very poor	Very poor	Very poor	Very poor	Poor
Very poor	Very poor	Fair	Very poor	Fair
Very poor	Very poor	Good	Very poor	Good.
Very poor	Very poor	Fair	Very poor	Good

TABLE 12.—*Wildlife habitat*

Soil name and map symbol	Potential for habitat elements—			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs
Los Osos: Cont.				
[1]LhG:				
Los Osos part	Very poor	Very poor	Good	Good
Maymen part	Very poor	Very poor	Poor	Poor
Maymen:				
MaE, MaG, [1]MbH	Very poor	Very poor	Poor	Poor
Metz:				
Mc	Fair	Fair	Good	Good
Milpitas				
MaC, MaD, MaE, MaF	Poor	Fair	Good	Good
[1]MeC:				
Milpitas part	Fair	Good	Good	Good
Positas part	Fair	Good	Fair	Fair
[1]MeD2:				
Milpitas part	Fair	Good	Fair	Fair
Positas part	Fair	Good	Fair	Fair
[1]MeE2:				
Milpitas part	Poor	Fair	Fair	Fair
Positas part	Poor	Fair	Fair	Fair
[1]MeF2:				
Milpitas part	Very poor	Very poor	Fair	Fair
Positas part	Very poor	Very poor	Fair	Fair
Montara:				
MgF2	Very poor	Very poor	Poor	Poor
Nacimiento:				
NaF2	Poor	Fair	Good	Good
[1]NeG:				
Nacimiento part	Very poor	Very poor	Good	Good
Lockwood part				
Orthents				
OAG				
Pits and dumps				
PA				
Riverwash				
RA				
Rock outcrop				
[1]RbG:				
Rock outcrop part				
Maymen part	Very poor	Very poor	Poor	Poor
San Andreas				
SaF2				
San Andreas part	Fair	Good	Good	Good
Tierra part	Fair	Good	Fair	Fair
[1]SaE2:				
San Andreas part	Poor	Fair	Good	Good
Tierra part	Poor	Fair	Fair	Fair
[1]SaF2:				
San Andreas part	Very poor	Very poor	Good	Good
Tierra part	Very poor	Very poor	Fair	Fair
Sanitary landfill areas				
SB				

potentials—Continued

Potential for habitat elements—Continued			Potential as habitat for—	
Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Very poor	Very poor	Poor	Very poor	Good.
Very poor	Very poor	Very poor	Very poor	Poor
Very poor	Very poor	Very poor	Very poor	Poor
Very poor	Very poor	Good	Very poor	Good
Very poor	Very poor	Fair	Very poor	Good
Poor	Very poor	Good	Very poor	Good
Poor	Very poor	Fair	Very poor	Fair
Very poor	Very poor	Fair	Very poor	Fair
Very poor	Very poor	Fair	Very poor	Fair
Very poor	Very poor	Fair	Very poor	Fair
Very poor	Very poor	Fair	Very poor	Fair
Very poor	Very poor	Poor	Very poor	Fair
Very poor	Very poor	Poor	Very poor	Fair
Very poor	Very poor	Very poor	Very poor	Poor
Very poor	Very poor	Fair	Very poor	Good.
Very poor	Very poor	Poor	Very poor	Good
Very poor	Very poor	Very poor	Very poor	Poor
Very poor	Very poor	Good	Very poor	Good.
Very poor	Very poor	Fair	Very poor	Fair
Very poor	Very poor	Fair	Very poor	Good
Very poor	Very poor	Fair	Very poor	Fair
Very poor	Very poor	Poor	Very poor	Good.
Very poor	Very poor	Poor	Very poor	Fair.

TABLE 12.—*Wildlife habitat*

Soil name and map symbol	Potential for habitat elements—			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs
Santa Lucia				
ScD2, ScE2	Fair	Good	Fair	Fair
ScF2	Poor	Fair	Fair	Poor
ScG	Very poor	Very poor	Fair	Fair
Tierra				
TaL2				
Tierra part	Very poor	Very poor	Fair	Fair
San Andreas part	Very poor	Very poor	Good	Good
Todos				
TbD2, TbE2	Fair	Good	Good	Good
TcF2				
Todos part	Poor	Fair	Good	Good
Lodo part	Very poor	Very poor	Poor	Poor
Xerorthents, cut and fill areas				
XA				
Zaca				
ZaC2, ZaE2	Fair	Good	Poor	Poor
ZaF2	Poor	Fair	Poor	Poor

This mapping unit is made up of two or more dominant kinds of soil. See description of the mapping unit for composition and

areas include California quail, ground squirrel, blackbirds, field sparrow, cottontail rabbit, other birds, and some deer.

Wetland habitat consists of water-tolerant plants in open, marshy, or swampy shallow water areas. Examples of wildlife attracted to this habitat are ducks, geese, heron, and shore birds.

Rangeland habitat consists of wild herbaceous plants and shrubs on range. Examples of wildlife attracted to this habitat are mule deer, coyote, ground squirrel, bobcat, jackrabbit, California quail, and other birds.

Formation and Classification of the Soils

In this section, the major factors of soil formation and their effects on the soils are discussed. The current system for classifying soils are briefly defined, and the classification of the soils by series and higher categories are described.

Factors of Soil Formation

The characteristics of a soil are the result determined by five factors of soil formation. These factors are parent material, climate, relief, living organisms, and time. Each of these factors affects the formation of each soil and each modifies the effect of the other four.

Parent material is the result of weathering of rocks and determines the basic composition of the soil. Climate and plants and animals are the active forces of soil formation. Relief modifies the effects of climate and vegetation mainly by its influence on runoff and temperature. Time is needed to change parent material into soil, and generally, a long time is needed for distinct soil horizons to form.

The interaction among factors is more complex for some soils than for others and the importance of the individual factors differs from place to place.

Parent material

Parent material is the unconsolidated mass from which soil forms. It strongly affects the mineral composition, hardness, grain size, and amount and availability of plant nutrients for native plant growth. The complex geologic formations of this area (*4, 5*) have produced various and highly contrasting soils. The kinds of parent material in the survey area are discussed in the following paragraphs.

Hard sandstone and shale.—These formations are well consolidated and weather slowly. They include the Gaviota, Secata, Coldwater, Cosydell and Matilija Formations and are marine in origin. The materials are of the early Oligocene and late Eocene age. Most of the soils formed in these areas are sandy loams or fine sandy loams and contain numerous stones and boulders. They typically are less than 20 inches deep to bedrock. Principal soils are Maymen and Gaviota.

Soft fine sandstone and shale.—These formations are softly consolidated and typically weathered to a depth of 30 inches or more. Clay accumulates in the subsoil and deep gullies are easily formed when the vegetation is disturbed. The surface layer ranges from sandy loam to clay loam, and the subsoil is generally finer. Prin-

potentials—Continued

Potential for habitat elements—Continued		Potential as habitat for—		
Wet and plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Very poor	Very poor	Fair	Very poor	Fair
Very poor	Very poor	Fair	Very poor	Fair
Very poor	Very poor	Poor	Very poor	Fair
Very poor	Very poor	Very poor	Very poor	Poor
Very poor	Very poor	Poor	Very poor	Good
Very poor	Very poor	Good	Very poor	Good
Very poor	Very poor	Fair	Very poor	Good
Very poor	Very poor	Very poor	Very poor	Poor
Very poor	Very poor	Fair	Very poor	Poor
Very poor	Very poor	Poor	Very poor	Poor

behavior characteristics of the whole mapping unit.

cipal soils are Sespe, Todos, San Andreas, Los Osos, and Tierra. Formations include Santa Barbara of Pleistocene age and Sespe, Alegria, Secate, Cosydell of Eocene and Oligocene age.

Coarse acid sediments.—These coarse sediments are mostly [illegible] from marine sources. Arnold and Baywood soils formed from these sediments. Arnold soils formed from the Santa Barbara Formation of Pleistocene age. Baywood formed on old stabilized sand dunes of Recent age. Deep water soaking through the sandy material has caused soil changes to considerable depths in the older soils of this group. Recent soils have had [illegible] ter. Dune Land is also part of this group.

Diatomaceous shale and Monterey Shale.—Soils that formed on these formations are gray to dark gray, are granular and permeable, and have little or no clay accumulation in the subsoil. Soils formed over hard Monterey Shale are shallow and contain large amounts of shale fragments. Soils formed on soft shale are deeper and contain few shale fragments.

Diatomaceous shale is a soft white siliceous deposit of the skeletons of diatoms, microscopic marine algae. The shale is very light weight with a specific gravity of about 0.85. Crow Hill soils formed on these deposits. These soils have a low bulk density and are silty in texture.

Monterey Shale is made up of predominantly siliceous shales that are related to the diatomaceous formation. It has been altered to brittle, cherty, highly fractured, hard shale. Lopez and Santa Lucia soils are the main soils formed on this formation.

These formations are of marine origin of late and middle Miocene age.

Basic igneous rock formations.—In the far western part of the survey area, a small area of soils formed on basic igneous rock. These soils tend to be shallow, less than 20 inches deep to bedrock, and stony or rocky because of uneven weathering of bedrock. Textures are moderately fine and fine. Mortara soils and small inclusions of other soils make up the soils in this group. The rock is serpentine of Late Jurassic age.

Soft calcareous mudstone and shale.—These formations are soft, massive, fine-grained mineral marine deposits. Lime is abundant in these deposits. Soils formed on these formations are fine clay loams and clays and are generally 30 to 60 inches thick. The soils in this group include the Ayar, Diablo, Linne, Nacimiento, and Zaca soils. The Rincon Formation of late Miocene age is the most important of these rocks.

Terrace deposits.—Terrace deposits contain a wide variety of soil material, including sandy to clayey material. Gravels, cobbles, stones, and boulders may be present in varying amounts. Of all the parent materials, the direct effect of terrace deposits on the soil is, perhaps, the most obscure because most of the deposits were derived from several sources. Also, weathering, climate, and vegetation have had time to alter the parent material. Milpitas, Positas, Concepcion, Tierra, and Ballard soils formed in these terrace deposits.

Young alluvial deposits.—These deposits are made up of soil material that has been washed from higher areas and carried by rivers, creeks, or small drainageways to lower levels. Many deposits have been in place for only a short time, and organisms and climate have had little effect on the soils. When a soil is formed on material washed from only one upland soil, it bears

great similarities to that soil. For example, the Agueda soil is similar to Zaca and Ayar soils in texture, color, and lime content. However, most alluvial soils in this survey area are mixtures of several types of soil material and do not resemble any particular one. Most are classified according to their drainage, texture, and reaction. Agueda, Botella, Camarillo, Cortina, Elder, Metz, Soboba, and Goleta soils formed in young alluvial deposits.

Climate

The climate of this survey area is dominated by marine influence as is typical of the south coastal part of California. In summer, temperatures are mild or even cool near the ocean and are somewhat warmer inland. Winters are mild along the coast and colder inland and at higher elevations. Soils formed in this coastal zone have accumulated moderate amounts of organic matter in the upper part. This is in comparison with soils in the [illegible] of the State. Seasonal winter rains, ranging from 15 to 20 inches, are insufficient to leach bases from the soil profile. Consequently, reaction of the soils typically is slightly acid to moderately alkaline. Many soils also have lime accumulations in the subsoil and others have lime throughout the profile because the rainfall is not sufficient to leach them. Clay tends to accumulate at a depth of 18 to [illegible] inches in older soils as a result of relocation from leaching by rainfall.

The alternate wet and dry periods cause soils high in montmorillonitic clay to shrink and swell. Wide cracks develop in Ayar, Diablo, and Zaca soils. Sloughing from the surface and sides of cracks tends to mix surface soil with material below and make textural changes in the profile indistinct.

Relief

Relief determines the elevation, slope, and position of the soil on the landscape. Elevation influences soil formation mainly through its effect on climate. Slope and position of the soil affect soil formation through their influence on the movement of water. Very steep soils [illegible]. Material is rapidly eroded from the surface and soils tend to be shallow. Plants do not grow well and the effect of plants and animals on the soils is slight. Very steep soils are considered young even though the parent material is old. These soils strongly reflect the features of the parent material. For example, the characteristics of the Maymen soil have been affected by their very steep slopes. These soils are only 10 to 20 inches deep, and the organic matter enriched surface layer is only about 3 inches thick. They show little profile development, as soil is lost through erosion nearly as fast as it is formed through weathering.

Gently or moderately sloping soils generally show the effects of parent material, climate, and living organisms. Time becomes a factor in the degree of the soil formation process.

Where soils are gently sloping or level, most rainfall soaks in or evaporates. Additional water may flow from higher soils into some of these soils. Little soil material is lost through erosion and in places new soil is deposited. If the soil is permeable and rainfall is high, bases are readily leached. If the soil is moist for long periods, grass and grasslike plants grow abundantly, and the surface layer is commonly dark gray and has high organic-matter content. In some soils that have a high water table, the subsoil is mottled or has light gray or bluish colors caused by reduction of iron. Bases tend to accumulate in the subsoil where rainfall is not heavy enough to leach them from the subsoil.

Living organisms

Plants, burrowing animals, insects, bacteria, and fungi are important in formation of soils. They are responsible for gains and losses of organic matter and nitrogen, gains and losses of plant nutrients, and changes in soil structure and porosity.

Plants generally have the greatest effect on soil formation. Two extensive types of vegetation are in the area. One is annual grasses. Grasses rarely occur alone and typically grow with forbs, sagebrush, or oak trees. In some places, the brush or oaks may be very sparse or lacking. In others, oaks grow in open parklike stands and less commonly in thick dense stands. The other extensive type of vegetation in the area is chaparral cover. It is commonly called "hard" brush and is characterized by chamise, manzanita, ceanothus, scrub oak, and others.

Where grasses and forbs have grown for a long time the soils are [illegible] gray or grayish brown to a depth of 10 to [illegible] inches. On north-facing slopes where the soils are moist for long periods and the vegetation is more abundant, gray colors extend deeper into the soil.

Chaparral cover grows on shallow, droughty areas such as Maymen soils and Rock outcrop. The surface layer under this brush cover has only 1 to 3 inches darkened by organic matter.

The effect of animals on soil in the area is less apparent. No distinct or major soil features are attributed [illegible] to animal activity. Ground squirrels and pocket gophers tend to mix the surface layer and subsoil by burrowing and nesting at different levels. Earthworms, insects, bacteria, and fungi change organic matter from raw form to humus that is incorporated into the soil. Their activity makes plant nutrients available for growth.

Time

Time is the factor of soil formation that determines the degree of alteration of parent material caused by the other factors. For this reason, the differences in the length of time that parent materials have been in place are commonly reflected in the character of the soil. The soils in this survey range from young to old.

Young soils, such as Metz, have little or no profile development. The surface and substratum essentially have the same color, texture, and reaction except for variations in stratification. The old soils, such as Milpitas and Concepcion, have a well defined surface layer of fine sandy loam or loam over a very abrupt, compact, dense clay subsoil that is underlain by old alluvial deposits. This extremely abrupt and highly contrasting soil change is a result of soil formation over a long time.

Other soils, such as Botella, have large amounts of organic matter to a depth of 20 to 30 inches or more.

They are not considered recent but are young. They also have slight to moderate increases in clay caused by slow leaching. As more time elapses they develop characteristics similar to Concepcion soils. In some soils the dominant influence of other factors, such as highly resistant parent material, may largely determine the features of the soil. Examples are Montara and Santa Lucia soils, both of which have little profile development.

Classification

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to management. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The narrow categories of classification, such as those used in detailed soil surveys, allow us to organize and apply knowledge about soils in managing farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas such as countries and continents.

The current system of classification (*9*) has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system the differentiae used as a basis for classification are soil properties that can be observed in the field, or that can be inferred either from other properties that can be observed in the field, or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or that affect soil genesis. In table 13 the soil series of Santa Barbara County, California, South Coastal Part, are placed in categories of the current system. Categories of the current system are defined briefly in the following paragraphs.

TABLE 13.—*Classification of the soils*

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Agueda	Fine-loamy, mixed, thermic Pachic Haploxerolls
Arnold	Aquents
Aquents	Aquepts
Argixerolls	Argixerolls
Arnold	Mixed, thermic Typic Xeropsamments
*Ayar	Fine, montmorillonitic, thermic Typic Chromoxererts
*Ballard	Fine-loamy, mixed, thermic Typic Argixerolls
Ballard variant	Loamy-skeletal, mixed, thermic Typic Argixerolls
Baywood	Sandy, mixed, thermic Entic Haploxerolls
Botella	Fine-loamy, mixed, thermic Pachic Argixerolls
Botella variant	Fine-loamy, mixed, thermic Pachic Argixerolls
Camarillo	Fine-loamy, mixed (calcareous), thermic Aquic Xerofluvents
Camarillo variant	Fine-loamy, mixed (calcareous), thermic Aquic Xerofluvents
Capistrano	Loamy-skeletal, mixed, thermic Typic Haploxerolls
Concepcion	Fine, montmorillonitic, thermic Typic Argixerolls
Corralitos	Loamy-skeletal, mixed, nonacid, thermic Typic Xerofluvents
Crow Hill	Fine-silty, mixed, thermic Pachic Haploxerolls
Diablo	Fine, montmorillonitic, thermic Chromic Pelloxererts
*Elder	Coarse-loamy, mixed, thermic Typic Haploxerolls
Gaviota	Loamy, mixed, nonacid, thermic Lithic Xerorthents
Gaviota	Coarse-loamy, mixed, thermic Fluventic Haploxerolls
*Arnold	Fine-loamy, mixed, thermic Calcic Pachic Haploxerolls
Lodo	Loamy, mixed, thermic Lithic Haploxerolls
Lopez	Loamy-skeletal, mixed, thermic Lithic Haploxerolls
Los Osos	Fine, montmorillonitic, thermic Typic Argixerolls
Mayerick	Loamy, mixed, mesic Typic Haploxerepts
Metz	Sandy, mixed, thermic Typic Xerofluvents
Milpitas	Fine, montmorillonitic, thermic Mollic Palexeralfs
*Montara	Loamy, serpentinitic, thermic Lithic Haploxerolls
*Nacimiento	Fine-loamy, mixed, thermic Calcic Haploxerolls
Orthents	Orthents
Pleyto	Fine, montmorillonitic, thermic Mollic Palexeralfs
San Andreas	Coarse-loamy, mixed, thermic Typic Haploxerolls
Santa Lucia	Clayey-skeletal, mixed, thermic Pachic Ultic Haploxerolls
Sespe	Fine, montmorillonitic, thermic Typic Argixerolls
Sorrento	Sandy-skeletal, mixed, thermic Typic Xerofluvents
Tierra	Fine, montmorillonitic, thermic Mollic Palexeralfs
Todos	Fine, montmorillonitic, thermic Typic Argixerolls
Xererts	Xererts
Zaca	Fine, montmorillonitic, thermic Vertic Haploxerolls

ORDER. Ten soil orders are recognized. The differentiae for the orders are based on the kind and degree of the dominant sets of soil forming processes that have gone on.

SUBORDER. Each order is subdivided into suborders that are based primarily on properties that influence soil genesis and that are important to plant growth, or were selected to reflect what seemed to be the most important variables within the orders.

GREAT GROUP. Soil suborders are separated into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons, soil moisture and temperature regimes, and in base status.

SUBGROUPS. Great groups are subdivided into three kinds of subgroups: The central (typic) concept of the great groups (not necessarily the most extensive subgroup); the intergrades, or transitional forms to other orders, suborders, or great groups; and extragrade subgroups that have some properties that are representative of the great groups but that do not indicate transitions to any other known kind of soil.

FAMILY. Soil families group soils within a subgroup that have similar enough physical and chemical properties that responses to management are nearly the same for comparable phases. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineralogy, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, slope, and permanent cracks.

SERIES. The series consists of a group of soils that are formed from a particular kind of parent material and have horizons that, except for texture of the surface soil, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

General Nature of the Survey Area

In this section, the physiography, relief, drainage, climate, and water supply of the survey area are discussed. Also included is a brief history of the area and its development, changes, and activities.

Climate

Mild temperatures are the rule throughout the south coastal part of Santa Barbara County. Inland areas, particularly in valleys and at high elevations, show considerably more variation than do coastal locations. Average annual temperature in July along the coast is in the 60's. Inland the average maximum temperature is in the 80's. In January, the average minimum temperature is in the 40's along the coast and in the 30's inland. Precipitation is concentrated in the six-month period from November through April, with very little during the rest of the year. The average annual precipitation ranges from 14 inches in some coastal areas to about 30 inches in some of the higher elevations. Coastal zones are characterized by low cloudiness and fog from the ocean during the night hours of summer. This usually dissipates during early morning hours. Sunshine is abundant in higher inland areas. In winter, migrant storms bring general cloudiness to the area, but in most places an average of only 60 to 80 days each year are cloudy. Winds are usually light and variable in direction. Temperature and precipitation data for two stations in the county are given in table 14.

In general, temperatures are mild near the coast and the daily range is moderate. Inland the range is somewhat greater.

Along the coast, the average maximum temperature in July is in the upper 60's or lower 70's. In the foothills and the mountains, the temperature is in the 80's with local variations due to topography and elevations. Extreme high temperature of above 100° F. occurs at all points of the survey area, although this temperature is rare and of short duration. Night temperatures in July drop to the low 50's in most areas.

In January, the average low temperature is in the 40's along the coast, while in the mountains, the temperature is in the middle 30's. In all parts of the Area, freezing temperatures have been recorded at one time or other, but most daytime temperatures are comfortable with average maximum in the high 50's or low 60's.

In a narrow zone along the coast, freezes are relatively infrequent due to marine influence. The average date of the last 32° F. reading in the spring is in January within this zone. Freeze dates extend to the middle of March in some interior areas of the survey. The average date of the first freeze in the fall is after December 31st along the coast, but is in early December in the higher elevations of the interior. The result is an average growing season of around 250 days in the high mountains and 330 days or longer along the coast.

Precipitation in the area is concentrated in the winter months. Approximately 90 percent of the annual total precipitation is in the six months from November through April. Thundershowers sometimes occur in the mountains during the summer, but they do not account for any substantial part of the annual rainfall.

Average annual precipitation ranges from 14 inches at the Santa Barbara Airport to about 30 inches at high elevations in the Santa Ynez Mountains.

Seasonal totals vary considerably from year to year. A rainfall record for the city of Santa Barbara for 104 years shows an all time low rainfall of 4.49 inches in the 1876–1877 season and a high of 45.21 in the 1940–41 season. The average annual rainfall for Santa Barbara is 17.79 inches.

Winds at the Santa Barbara Airport blow from a southern quadrant most of the time; southwest winds prevail from October through March and south winds the rest of the year. The winds average about 6 miles per hour most of the year, increasing to 8 and 9 miles per hour in April and May.

High winds are infrequent. Available records indicate that in most areas windspeeds of 60 miles per hour occur once in 50 years. Once in 100 years, winds reach 65 miles per hour inland and about 80 miles per hour along the coast.

Cloudiness associated with migrating storms is minimal in the area, but there is a considerable amount of stratus cloudiness along the immediate coast and in

TABLE 14.—*Temperature and precipitation data*

[Santa Barbara Courthouse, elevation 120 feet]

Month	Temperature					Precipitation
	Maximum	Average daily maximum	Average	Average daily minimum	Minimum	Average
	°F	°F	°F	°F	°F	In.
January	84	64.8	52.6	40.3	20	3.97
February	88	65.7	54.0	42.2	27	3.65
March	92	67.9	56.0	44.1	30	2.74
April	96	69.7	58.6	47.5	35	1.30
May	98	71.8	61.1	50.3	37	.39
June	101	73.8	63.3	52.8	42	.10
July	103	77.7	67.1	56.5	44	.02
August	98	78.1	67.4	56.7	46	.02
September	104	78.6	66.8	54.9	38	.26
October	103	75.6	63.1	50.6	34	.69
November	97	72.8	58.5	44.2	28	1.59
December	92	67.4	54.7	42.0	25	3.12
Year	108	72.0	60.3	48.5	20	17.79

[Santa Barbara Airport, elevation 7 feet]

January	86	63.6	51.0	38.5	26	2.86
February	84	62.9	[illegible]	[illegible]	31	2.06
March	87	65.8	[illegible]	[illegible]	36	2.61
April	90	67.4	[illegible]	[illegible]	33	.93
May	96	69.9	[illegible]	[illegible]	39	.20
June	91	71.5	[illegible]	[illegible]	41	.02
July	94	73.5	[illegible]	[illegible]	45	.08
August	96	74.3	[illegible]	[illegible]	43	.01
September	97	74.6	[illegible]	[illegible]	42	.05
October	89	72.2	[illegible]	[illegible]	37	.42
November	[illegible]	[illegible]	[illegible]	[illegible]	31	1.52
December	87	[illegible]	[illegible]	[illegible]	28	3.20
Year	99	[illegible]	58.4	[illegible]	26	13.95

[Santa Barbara TV Peak, elevation 4,028 feet]

January						6.31
February						6.15
March						2.45
April						4.14
May						1.13
June						.04
July						(1)
August						(1)
September						.22
October						.31
November						2.50
December						5.72
Year						29.02

Trace

the coastal valleys. The sun shines about 60 to 70 percent of the time at Santa Barbara. It shines nearly 80 percent of the time in the fall. Somewhat more sunshine is likely over inland parts of the county.

There are 60 to 80 days per year that are cloudy. The rest are partly cloudy or clear and the sun shines much of the time.

Water Supply

The history of the south coastal part of Santa Barbara County has been one of insufficient or unreliable water supply. As early as 1888, the Santa Ynez River watershed was recognized as the only feasible source of dependable water supply for the in-

creasing population of the south coast area (*10*). In lower parts of small coastal valleys, the water table is close to sea level. Because of fine textured underlying material, these areas hold little underground water and wells are limited in capacity. Watersheds are narrow and slopes are steep, so that storm water runs off rapidly and ground water recharge is slow.

Three dams and reservoirs on the Santa Ynez River now supply most of the water used in the populated Santa Barbara area. The last to be built and by far the largest is Cachuma Dam. It was completed in 1953. Water from its reservoir is brought through the Santa Ynez Mountains to the coastal area by the Tecolote Tunnel and distributed by pipeline from El Capitan east to Goleta, Santa Barbara, Montecito, Summerland, and Carpinteria. Two earlier dams and reservoirs on the Santa Ynez River that are still in service are Gibraltar and Juncal Dams. Gibraltar water is brought through the Santa Ynez Mountains by the Mission Tunnel and Juncal water from Jameson Lake is brought by the Dalton Tunnel.

In normal or high rainfall years, the water storage [illegible] adequate water for all uses. When rainfall is below normal two or three years, water shortages have occurred and restricted water use has been imposed. It is apparent that extensive new urban development or agricultural expansion will require additional water supply.

The principal source of water west of the area served by imported water is wells and springs. A few small farm ponds have been constructed for cattle watering, but the present total supply of water is not sufficient for extensive irrigation or urban development.

Physiography, Relief and Drainage

This survey area covers the south slopes of the Santa Ynez Mountain range. This is one of the few sections of the Coast Range that lies east and west. Most of the mountains consist of consolidated but fractured sandstones and shales. The only exceptions are small areas of volcanic rock and some metamorphosed sedimentary rock in the far western part. Most of the sandstone and shale is marine in origin and most formations are sharply tilted.

The upper part of the Santa Ynez Mountains is very rough, stony, and precipitous in most places. The lower foothills and mountains in the western part of the area are rolling to very steep but are less rough and stony than the eastern part of the area. Between the foothills and the ocean are old alluvial terraces, low smooth hills, small valleys, and a few small areas that have high water tables. Carpinteria and Goleta Valleys terminate in tidal marshes. The coastline, for the most part, consists of narrow beaches below cliffs that have been cut by wave action into terrace material and underlying bedrock.

Drainage consists of many short intermittent streams that originate in the mountains and flow to the ocean. Most drainageways have cut deeply into old terraces or have built alluvial fans and small valleys. Drops in elevation from over 4,000 feet to sea level, within 3 to 7 miles, often result in torrential flows of water in drainageways from the Santa Ynez Mountains. Boulders up to 10 feet in diameter, large trees, and other debris are carried from the mountains into valleys resulting in damage to land and structures. These destructive floods usually occur after a watershed has burned and when intense mountain storms occur.

History

For more than 10,000 years prior to settlement by the Spanish, Chumash Indians lived in the area. These Indians lived by gathering food from the sea, supplemented by small game and wild plants. Because they depended principally on ocean shellfish for food, they have been called Digger Indians. Their living areas are still much in evidence. The soils on which they lived have dark color, high lime content, and numerous shell fragments, bones, and artifacts.

Many of these areas are indicated on the maps by a special symbol. (See [illegible] page.)

The Santa Barbara Coast was first explored by the Spanish in October 1542, but it was not until 1782 that the presidio was established at Santa Barbara. The Santa Barbara Mission was located there in 1786 and has since been in continuous service. Spanish rule of California was changed to Mexican rule in 1819. Later, in February 1848, California became a territory of the United States and in 1850 was admitted to the union. Santa Barbara County was organized at that time with Santa Barbara as county seat.

The first county road was started in 1860, finished in 1861, and the first stagecoach from San Francisco arrived April 1, 1861. The route was essentially the same as the present day Highway 101. Most freight and passengers were moved by water until rail service was established in 1887 by a branch line from Newhall. It was 14 years later that the Southern Pacific Railroad completed the present line along the coast from San Francisco to Los Angeles. Rail service opened up new markets and fostered the growth of tourist trade.

Presently the area is served by several airlines out of the [illegible] Airport at Goleta. U.S. Highway 101 and State Highway 150 are the only roads in the area and both carry freight and passengers. The Southern Pacific Railroad serves the area for both freight and passengers.

The main industries in the area are concerned with developing and processing oil and diatomaceous earth and processing agricultural products. There are numerous light industries. Tourist trade is also an important source of income. Private and public schools are available. The University of California, Santa Barbara, has its campus on the coast near Goleta.

Population is concentrated in the eastern part of the area, mostly within 3 miles of the coast. This is the area that has water imported from the Santa Ynez River watershed. The rest of the area, dependent upon [illegible] is sparsely populated.

Agriculture in the area has followed a course similar to many other sections of south coastal California. Under Spanish and Mexican rule, cattle and sheep raising was the main pattern of agriculture. After Statehood, cattle and sheep raising continued to be most important until the 1900's. At that time, raising dryland beans, hay, and grain became important. When

water became available in the early 1920's, lemon production began on a large scale. Presently avocados and lemons are grown on a large scale and specialty crops, such as strawberries, pumpkins, and flowers are grown on a small scale. Growing flowers under plastic houses is an important industry in Carpinteria Valley. Cattle raising is still important in the western part of the area, but dryland production of beans and grain has been largely discontinued.

Mild climate and scenic beauty continue to attract people to the area, and present trends indicate that urbanization will continue (fig. 14). Recent uncertain water supply, however, has slowed building in some parts of the area. Water supply will again determine the future of this part of the south coast.

Literature Cited

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Method for [illegible] of soils for engineering purposes. ASTM Stand. D 2487-69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) California Division of Highways. 1968. Materials manual for testing and control procedures. Ed. 2, 2 vol., illus.

(4) Dibblee, T. W., Jr. 1950. Geology of southwestern Santa Barbara County, California. Calif. Div. Mines and Geol. Bull. 150, 95 pp., illus.

(5) Dibblee, T. W., Jr. 1966. Geology of the Central Santa Ynez Mountains, Santa Barbara County, California. Calif. Div. Mines and Geol. Bull. 186, [illegible] pp., illus.

(6) Goodall, G. E., D. M. Hansen, and R. M. Burns. 1962. Santa Barbara County avocado root rot soil survey. Illus.

(7) Shaw, Samuel P. and C. Gordon Fredine. 1956. Wetlands of the United States. U.S. Dep. Inter., Fish and Wildl. Serv. Circ. 39.

(8) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. [illegible] issued May 1962]

(9) United States Department of Agriculture. 1975. Soil Taxonomy. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

(10) United States Department of the Interior, Bureau of Reclamation. 1956. Cachuma project. GPO 972000, 21 pp., illus.

(11) Wischmeir, W. H., C. B. Johnson, and B. V. Cross. 1971. Journal of Soil and Water Conservation, pp. 189–193, illus.

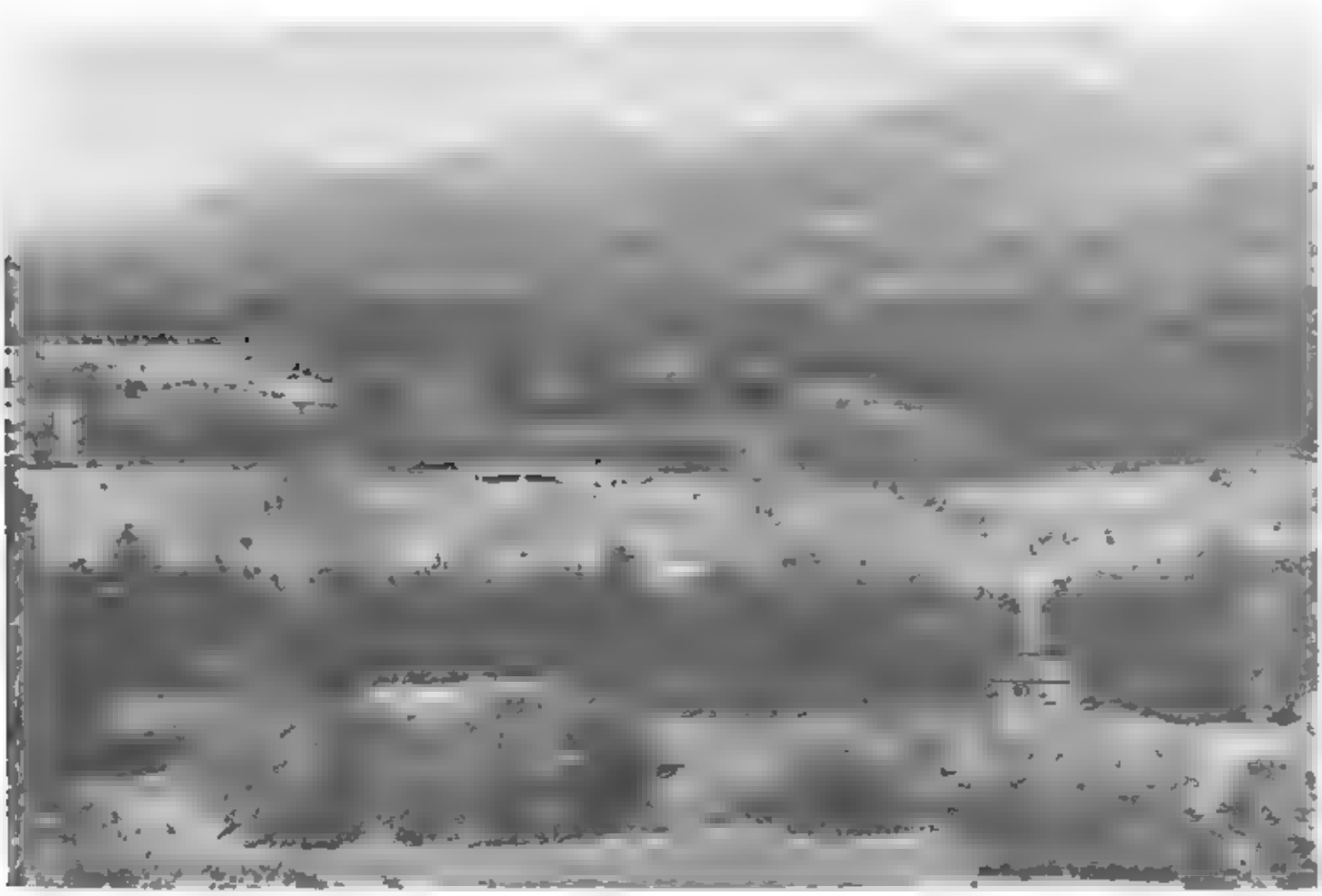

Figure 14.—Lemon orchards, a golf course, and houses on Ballard, Cortina, and Milpitas soils.

Glossary

Acre-foot. The quantity of water, soil, or other material that will cover 1 acre to a depth of 1 foot.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single mapping unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	More than 9

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or sticky when wet.

Color, soil. Color of soil is largely related to the content of organic matter. As a rule, the darker the surface soil, the more organic matter it contains. Streaks and spots of gray, yellow, and brown in the lower layers generally indicate poor drainage and poor aeration. Gray-colored layers generally [illegible].

Compressible. Excessive decrease in volume of soft soil under load.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Cutbanks cave. Unstable walls of cuts made by earthmoving equipment. The soil sloughs easily.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive heavy rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Effective rooting depth. The depth to which a soil is readily penetrated by roots and is used for extraction of water and plant nutrients. Approximate depth classes are—

	Inches
Very deep	More than 60
Deep	40 to 60
Moderately deep	20 to 40
Shallow	10 to 20
Very shallow	Less than 10

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example fire, that exposes a bare surface.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Forb. Any herbaceous plant not a grass or a sedge.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of

depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these, (2) by prismatic or blocky structure, (3) by redder or browner colors than those in the A horizon, or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Intake rate. The rate at which water enters the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Leveling (of land). The reshaping of the soil surface to make for more uniform application of irrigation water.

Low strength. Inadequate strength for supporting loads.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—few, common, and many; size—fine, medium, and coarse; and contrast—faint, distinct, and prominent. The size measurements are of the diameter along the greatest dimension. Fine indicates less than 5 millimeters (about 0.2 inch); medium, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and coarse, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three single variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Percs slowly. The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are very slow (less than 0.06 inch), slow (0.06 to 0.2 inch), moderately slow (0.2 to 0.6 inch), moderate (0.6 to 2.0 inches), moderately rapid (2.0 to 6.0 inches), rapid (6.0 to 20 inches), and very rapid (more than 20 inches).

Piping. Formation by moving water of subsurface tunnels or pipelike cavities.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Range site. An area of range where climate, soil, and relief are sufficiently uniform to produce a distinct kind and amount of native vegetation.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH		pH
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage. The movement of water through the soil. Seepage adversely affects the specified use.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: very coarse sand (2.0 millimeters to 1.0 millimeter); coarse sand (1.0 to 0.5 millimeter); medium sand (0.5 to 0.25 millimeter); fine sand (0.25 to 0.10 millimeter); very fine sand (0.10 to 0.05 millimeter); silt (0.05 to 0.002 millimeter); and clay (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—platy (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are either single grained (each grain by itself, as in dune sand) or massive (the particles

adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but the limited geographic soil area does not justify creation of a new series.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Workability (of soil). The relative amount of work required to till the soil and the relative difficulty to using farm machinery.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and the soil series to which it belongs. The capability classification system is discussed on pages 55 to 60.

Map symbol	Mapping unit	Page	Capability unit Irrigated	Capability unit Dryland	Vegetative soil group	Range site	Avocado root rot hazard
			Symbol	Symbol	Letter	Name	Rating
AaA	Agueda silty clay loam, 0 to 2 percent slopes	9	I(19)	----------	A	----------	Slight
AaC	Agueda silty clay loam, 2 to 9 percent slopes	9	IIe-1(19)	IIe-1(15)	A	Clayey	Slight
AaD	Agueda silty clay loam, 9 to 15 percent slopes	9	IIIe-1(19)	IIIe-1(15)	A	Clayey	Slight
AbC	Ap[illegible] sandy loam, 2 to 9 percent slopes		IIe-1	----------	A	----------	Slight
AC	Aquents, fill areas--- Onsite investigation needed for most interpretations	9			J	----------	Severe
AD	Aquepts, flooded	9	VIIIw-1(19)	----------	J	----------	Severe
AE	Argixerolls and Xerepts landslide areas		VIIe-1(19)	VIIe-1(15, 20)	J	Clayey	Severe
AgD	Arnold loamy sand, 9 to 15 percent slopes	11	IVe-4(19)	----------	B	Sandy	Slight
AgE2	Arnold loamy sand, 15 to 30 percent slopes, eroded	11	VIe-1(19)	----------	B	Sandy	Slight
AgF2	Arnold loamy sand, 30 to 50 percent slopes, eroded	11	VIIe-1(19)	----------	B	Sandy	Slight
AgG	Arnold loamy sand, 50 to 75 percent slopes	11	VIIe-1(19)	----------	B	Sandy	Slight
AhE2	Ayar clay, 15 to 30 percent slopes, eroded	11	IVe-5(19)	IVe-5(15)	C	Clayey	Severe
AhF2	Ayar clay, 30 to 50 percent slopes, eroded	11	VIe-1(19)	VIe-1(15)	C	Clayey	Severe
AhG	Ayar clay, 50 to 75 percent slopes, eroded	11	VIIe-1(19)	VIIe-1(15)	C	Clayey	Severe
BaA	Ballard fine sandy loam, 0 to 2 percent slopes	12	I(19)	----------	A	----------	Moderate
BaC	Ballard fine sandy loam, 2 to 9 percent slopes	12	IIe-1(19)	IIe-1(15)	A	----------	Moderate
BbC	Ballard Variant, stony fine sandy loam, 2 to 9 percent slopes		IVs-7(19)	----------	J	----------	Moderate
BcC	Baywood loamy sand, 2 to 9 percent slopes	13	IIIe-4	[illegible]	B	Sandy	Slight
BE	Beaches	14	[illegible]	VIIIw-1(19)	Under influence of tide and wave action		
BgA	Bo[illegible] sandy loam, 0 to 2 percent slopes	14	I	IIc-1(15)	A	Clayey	Moderate
BgC	Bo[illegible] sandy loam, 2 to 9 percent slopes	14	IIe-1	IIe-1(15)	A	Clayey	Moderate
BhC	Botella shaly clay loam, 2 to 9 percent slopes	14	IIe-1(19)	IIe-1(15)	A	Clayey	Moderate
BkC2	Botella Variant silty clay loam, 2 to 9 percent slopes, eroded	14	IIe-1(19)	----------	A	Clayey	Moderate
BkD2	Botella Variant silty clay loam, 9 to 15 percent slopes, eroded	14	IIIe-1(19)	----------	A	Clayey	Moderate
Ca	Camarillo fine sandy loam	15	IIIw-2(19)	--- -------	E		
[illegible]	[illegible] loam	15	IIIw-13	[illegible]	E		
CcF	Capitan cobbly clay loam, 30 to 50 percent slopes	15	VIIe-1(19)	VIIe-1(15)	J	Shallow [illegible]	Severe

GUIDE TO MAPPING UNITS-CONTINUED

Map symbol	Mapping unit	Page	Capability unit Irrigated Symbol	Capability unit Dryland Symbol	Vegetative soil group Letter	Range site Name	Avocado root rot hazard Rating
CdG	Capitan-Rock outcrop complex, 50 to 75 percent slopes	20	VIIs-1(19)	VIIs-1(15)	J	Shallow Loamy-Rock outcrop complex	Severe
CeB	Concepcion loamy sand, 0 to 5 percent slopes	22	----------	IVe-3(15)	D	Claypan	Severe
CgA	Concepcion fine sandy loam, 0 to 2 percent slopes	22	IIIs-3(19)	----------	D	Claypan	Severe
CgC	Concepcion fine sandy loam, 2 to 9 percent slopes	22	IIIe-3(19)	IIIe-3(15)	D	Claypan	Severe
CgC2	Concepcion fine sandy loam, 2 to 9 percent slopes, eroded	22	IVe-3(19)	IVe-3(15)	D	Claypan	Severe
CgD2	Concepcion fine sandy loam, 9 to 15 percent slopes, eroded	22	VIe-1(19)	VIe-1(15)	D	Claypan	Severe
CgE2	Concepcion fine sandy loam, 15 to 30 percent slopes, eroded	23	VIe-1(19)	VIe-1(15)	D	Claypan	Severe
CgF2	Concepcion fine sandy loam, 30 to 50 percent slopes, eroded	23	----------	VIIe-1(15)	D	Claypan	Severe
ChC	Cortina stony loamy sand, 2 to 9 percent slopes	23	IVw-2(19)	(1/)	J	--------	Slight
CkD2	Crow Hill silty clay loam, 9 to 15 percent slopes, eroded	24	----------	IIIe-1(15)	G	Loamy	Severe
CkE2	Crow Hill silty clay loam, 15 to 30 percent slopes, eroded	24	----------	IVe-1(15)	G	Loamy	Severe
CkF	Crow Hill silty clay loam, 30 to 50 percent slopes	24	----------	VIe-1(15)	G	Loamy	Severe
CkG	Crow Hill silty clay loam, 50 to 75 percent slopes	25	----------	VIIe-1(15)	G	Loamy	Severe
DaC	Diablo clay, 2 to 9 percent slopes	25	IIe-5(19)	IIe-5(15)	C	Clayey	Severe
DaD	Diablo clay, 9 to 15 percent slopes	25	IIIe-5(19)	IIIe-5(15)	C	Clayey	Severe
DaE2	Diablo clay, 15 to 30 percent slopes, eroded	25	IVe-5(19)	IVe-5(15)	C	Clayey	Severe
DaF2	Diablo clay, 30 to 50 percent slopes, eroded	26	VIe-1(19)	VIe-1(15)	C	Clayey	Severe
DU	Dune Land	26	VIIIe-1(19)	VIIIe-1(15)	J	--------	Slight
EaA	Elder sandy loam, 0 to 2 percent slopes	27	IIs-4(19)	----------	A	--------	Slight
EaB	Elder sandy loam, 2 to 9 percent slopes	27	IIe-1(19)	----------	A	--------	Slight
Eb	Elder-Soboba complex, 2 to 9 percent slopes	27	IVw-2(19)	----------	-	--------	Slight
	Elder part	--	---------	----------	A	--------	------
	Soboba part	--	---------	----------	J	--------	------
	Mapped only in complex with Elder.						
ES	Escarpment	27	VIIIe-1(19)	VIIIe-1(15)	J	--------	------
GaE	Gaviota sandy loam, 9 to 30 percent slopes	28	VIe-1(19)	VIe-1(15)	G	Shallow Loamy	Severe
GaG	Gaviota sandy loam, 30 to 75 percent slopes	28	VIIe-1(19)	VIIe-1(15)	G	Shallow Loamy	Severe
GbG	Gaviota-Rock outcrop complex, 50 to 75 percent slopes	28	VIIs-1(19)	VIIs-1(15, 19)	G	Shallow Loamy-Rock outcrop complex	Severe

Map symbol	Mapping unit	Page	Capability unit Irrigated	Capability unit Dryland	Vegetative soil group	Range site	Avocado root rot hazard
			Symbol	Symbol	Letter	Name	Rating
GcA	Goleta fine sandy loam, 0 to 2 percent slopes	30	I(19)	----------	A	----------	Slight
GcC	Goleta fine sandy loam, 2 to 9 percent slopes	30	IIe-1(19)	IIe-1(15)	A	----------	Slight
GdA	Goleta loam, 0 to 2 percent slopes	30	I(19)	----------	A	----------	Slight
GU	Gullied Land	30	VIIIe-1(19)	VIIIe-1(15)	J	----------	Variable
LaE	Linne clay loam, 15 to 30 percent slopes	31	IVe-1(19)	IVe-1(15)	A	Clayey	Moderate
LaF2	Linne clay loam, 30 to 50 percent slopes, eroded	32	VIe-1(19)	VIe-1(15)	A	Clayey	Moderate
LaG	Linne clay loam, 50 to 75 percent slopes	32	VIIe-1(19)	VIIe-1(15)	A	Clayey	Moderate
LbG	Lodo-Rock outcrop complex, 50 to 75 percent slopes	32	VIIs-1(19)	VIIs-1(20)	-	Shallow Loamy-Rock outcrop complex	Severe
	Lodo part	--	----------	----------	G	----------	------
	Rock outcrop part	--	----------	----------	J	----------	------
LcG	Lodo-Sespe complex, 50 to 75 percent slopes	32	VIIe-1(19)	VIIe-1(20)	--	----------	Severe
	Lodo part	--	----------	----------	G	Shallow Loamy	------
	Sespe part	--	----------	----------	C	Clayey	------
LdG	Lopez-Rock outcrop complex, 50 to 75 percent slopes	33	VIIs-1(19)	VIIs-1(15)	-	Shallow Loamy-Rock outcrop complex	Severe
	Lopez part	--	----------	----------	G	----------	------
	Rock outcrop part	--	----------	----------	J	----------	------
LdH	Lopez-Rock outcrop complex, 75 to 100 percent slopes	33	VIIIs-1(19)	VIIIs-1(15)	J	----------	------
LeE2	Lopez-Santa Lucia complex, 9 to 30 percent slopes, eroded	33	VIIe-1(19)	VIIe-1(15)	G	----------	Severe
	Lopez part	--	----------	----------	-	Shallow Loamy	------
	Santa Lucia part	--	----------	----------	-	Loamy	------
LeF2	Lopez-Santa Lucia complex, 30 to 50 percent slopes, eroded	34	VIIe-1(19)	VIIe-1(15)	G	----------	Severe
	Lopez part	--	----------	----------	-	Shallow Loamy	------
	Santa Lucia part	--	----------	----------	-	Loamy	------
LgE2	Los Osos clay loam, 15 to 30 percent slopes, eroded	34	----------	IVe-3(15)	A	Clayey	Severe
LgF2	Los Osos clay loam, 30 to 50 percent slopes, eroded	35	VIe-1(19)	VIe-1(15)	G	Clayey	Severe
LhG	Los Osos-Maymen complex, 50 to 75 percent slopes	35	----------	VIIe-1(15)	G	----------	Severe
	Los Osos part	--	----------	----------	-	Clayey	------
	Maymen part	--	----------	----------	-	Shallow Loamy	------
MaE	Maymen stony fine sandy loam, 15 to 30 percent slopes	36	----------	VIIe-1(20)	G	Shallow Loamy	Severe
MaG	Maymen stony fine sandy loam, 30 to 75 percent slopes	36	----------	VIIe-1(20)	G	Shallow Loamy	Severe
MbH	Maymen-Rock outcrop complex, 50 to 100 percent slopes	36	----------	VIIIs-1(15, 20)	J	----------	Severe
Mc	Metz loamy sand	37	IIIw-4(19)	----------	B	----------	Slight
MdC	Milpitas stony fine sandy loam, 2 to 9 percent slopes	38	IVs-3(19)	IVs-3(15)	D	Claypan	Severe

GUIDE TO MAPPING UNITS-CONTINUED

Map symbol	Mapping unit	Page	Capability unit Irrigated	Capability unit Dryland	Vegetative soil group	Range site	Avocado root rot hazard
			Symbol	Symbol	Letter	Name	Rating
MdD	Milpitas stony fine sandy loam, 9 to 15 percent slopes	38	IVs-3(19)	IVs-3(15)	D	Claypan	Severe
MdE	Milpitas stony fine sandy loam, 15 to 30 percent slopes	38	VIs-1(19)	VIs-1(15)	D	Claypan	Severe
MdF	Milpitas stony fine sandy loam, 30 to 50 percent slopes	38	VIIs-1(19)	VIIs-1(15)	D	Claypan	Severe
MeC	Milpitas-Positas fine sandy loams, 2 to 9 percent slopes2/	38	IIIe-3(19)	IIIe-3(15)	D	Claypan	Severe
MeD2	Milpitas-Positas fine sandy loams, 9 to 15 percent slopes, eroded2/	38	IVe-3(19)	IVe-3(15)	D	Claypan	Severe
MeE2	Milpitas-Positas fine sandy loams, 15 to 30 percent slopes, eroded2/	39	VIe-1(19)	VIe-1(15)	D	Claypan	Severe
MeF2	Milpitas-Positas fine sandy loams, 30 to 50 percent slopes, eroded2/	39	VIIe-1(19)	VIIe-1(15)	D	Claypan	Severe
MgF2	Montara stony clay, 15 to 50 percent slopes, eroded	40	----------	VIIs-1(15)	J	Shallow Loamy	Severe
NaF2	Nacimiento silty clay loam, 30 to 50 percent slopes, eroded	41	VIe-1(19)	VIe-1(15)	A	Clayey	Severe
NbG	Nacimiento complex, landslide, 30 to 75 percent slopes	41	----------	VIIe-1(15)	-	Clayey	Severe
	Nacimiento part	--	----------	----------	A	------	------
	Landslide part	--	----------	----------	J	------	------
OAG	Orthents, 50 to 75 percent slopes	41	VIIe-1(19)	VIIe-1(15)	J	-------	Variable
PA	Pits and dumps	41	Onsite investigation is needed				
RA	Riverwash	43	VIIw-1(19)	VIIw-1(20)	J	-------	Slight
Rb	Rock outcrop-Maymen complex, 75 to 100 percent slopes	43	----------	VIIIs-1(15, 20)	-	-------	Severe
SaD2	San Andreas-Tierra complex, 9 to 15 percent slopes, eroded	44	IVe-1(19)	IVe-1(15)	-	-------	Severe
	San Andreas part	--	----------	----------	G	Loamy	------
	Tierra part	--	----------	----------	D	Claypan	------
SaE2	San Andreas-Tierra complex, 15 to 30 percent slopes, eroded	44	VIe-1(19)	VIe-1(15)	-	-------	Severe
	San Andreas part	--	----------	----------	G	Loamy	------
	Tierra part	--	----------	----------	D	Claypan	------
SaF2	San Andreas-Tierra complex, 30 to 50 percent slopes, eroded	44	VIIe-1(19)	VIIe-1(15)	-	-------	Severe
	San Andreas part	--	----------	----------	G	Loamy	-------
	Tierra part	--	----------	----------	D	Claypan	-------
SB	Sanitary landfill areas	45	Onsite investigation is needed				
ScD2	Santa Lucia shaly clay loam, 9 to 15 percent slopes, eroded	45	IIIe-1(19)	IIIe-1(15)	G	Loamy	Severe
ScE2	Santa Lucia shaly clay loam, 15 to 30 percent slopes, eroded	45	IVe-1(19)	IVe-1(15)	G	Loamy	Severe
ScF2	Santa Lucia shaly clay loam, 30 to 50 percent slopes, eroded	45	VIe-1(19)	VIe-1(15)	G	Loamy	Severe
ScG	Santa Lucia shaly loam, 50 to 75 percent slopes	46	VIIe-1(19)	VIIe-1(15)	G	Loamy	Severe
TaE2	Tierra-San Andreas complex, 15 to 30 percent slopes, severely eroded	48	----------	VIIe-1(15)	-	-------	Severe
	Tierra part	--	----------	----------	D	Claypan	------
	San Andreas part	--	----------	----------	G	Loamy	------

Map symbol	Mapping unit	Page	Capability unit Irrigated	Capability unit Dryland	Vegetative soil group	Range site	Avocado root rot hazard
			Symbol	Symbol	Letter	Name	Rating
TbD2	Todos clay loam, 9 to 15 percent slopes, eroded	49	IIIe-3(19)	---	A	Clayey	Severe
TbE2	Todos clay loam, 15 to 30 percent slopes, eroded	49	IVe-3(19)	IVe-3(15)	A	Clayey	Severe
TdF2	Todos-Lodo complex, 30 to 50 percent slopes, eroded	49	VIe-1(19)	VIe-1(15)	-	---	Severe
	Todos part	--	---	---	A	Clayey	---
	Lodo part	--	---	---	G	Shallow Loamy	---
XA	Xerorthents, cut and fill areas-	49	Onsite investigation is needed				
ZaD2	Zaca clay, 9 to 15 percent slopes, eroded	51	IIIe-5(19)	IIIe-5(15)	C	Clayey	Severe
ZaE2	Zaca clay, 15 to 30 percent slopes, eroded	51	IVe-5(19)	IVe-5(15)	C	Clayey	Severe
ZaF2	Zaca clay, 30 to 50 percent slopes, eroded	51	VIe-1(19)	VIe-1(15)	C	Clayey	Severe

1/ Small areas are mapped in Resource area 15. These areas are better suited to grazing than to other uses.

2/ Milpitas and positas soils have the same groupings and interpretations.

U.S. GOVERNMENT PRINTING OFFICE : 1981—338-554/36